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ADDRESS AT THE ANNUAL GENERAL MEETING
of the Society held on 26 June 1939, by the President

FIELD-MARSHAL SIR PHILIP CHETWODE, O.M.

THE Society has lost several distinguished Fellows during the last year. I must first refer to the death of my immediate predecessor in this office, *Professor Henry Balfour*, President of our Society from 1936 to 1938. An account of his distinguished services to anthropology and geography has appeared in our *Journal*; it is fitting that I should again record his long and devoted work on behalf of our Society both as a Member of Council and, despite a crippling illness borne with great courage and cheerfulness, as President.

Of our Honorary Members I have to record the deaths of *H.R.H. Prince Arthur of Connaught*, who in the pursuit of his public duties had travelled widely and had won particular distinction as Governor-General of the Union of South Africa; of *Cavaliere Filippo De Filippi*, scientist, mountaineer, and traveller, who was very well known to us for his great expedition to the Himalaya and Karakoram in 1913–14, for which he received our Patron's Medal; and of *Dr. Donaldson Smith*, also a Gold Medallist, who was an early traveller in the Lake Rudolf region of East Africa. To these must be added the name of *Sir W. Mitchell Ramsay*, a Victoria Medallist, well known for his researches in the historical geography of Asia Minor, and *Professor G. Hellmann*, formerly Director of the Prussian Meteorological Institute. Among former Councillors we have lost *Sir Matthew Nathan*, for some years also a Vice-President, who as Governor of Queensland did much to encourage research on the Great Barrier Reef of Australia; *Sir Reginald Tower*, formerly H.B.M. Minister to the Argentine Republic and High Commissioner at Danzig; and *Brig.-General M. E. Willoughby*, who had seen service in many campaigns, and had a special knowledge of China.

I now turn to the work of expeditions in the field, the support of which forms an important part of the Society's work, and from the reports of which we draw a large proportion of our lectures and the papers printed in our *Journal*. I shall first mention those which have returned in the past year.

Mr. Evert Barger has given us an excellent account of his archaeological

reconnaissance in Swat and northern Afghanistan, made possible by the cooperation of the Afghan Government and M. Hackin, of the French Archaeological Mission. Mr. Barger travelled from Kabul across the Hindu Kush through Khanabad and Faizabad to the borders of Wakhan. This area occupies an important position on the route from western Asia to the Tarim basin and the East, a route of great cultural importance in the history of civilization. Though primarily archaeological, this preliminary expedition has added to our knowledge of the geography of this imperfectly known area. Mr. Barger, in company with Mr. K. de S. Codrington, of the Victoria and Albert Museum, and with the support of the Government of India and of our Society, is returning to Afghanistan to continue the excellent work thus begun.

Sir Aurel Stein has recently returned after carrying out important researches in Transjordan and 'Iraq. In the last few years, Père Poidebard, the French archaeologist, has traced the Roman boundary in Syria, and Sir Aurel, from air photographs and examination of the ground, has been able to map its extension into central Mesopotamia.

Of the mountaineering expeditions last year to the Himalaya and Karakoram, three require special reference here. We have heard from Mr. H. W. Tilman, the leader, an account of the Mount Everest expedition, and of the bad conditions experienced. Unfortunately the hope expressed at the last Annual Meeting that the weather might improve was not fulfilled. Camp IV was established by the usual route, but not occupied as the snow was in bad condition. The party however was later able to establish a route up the west side of the North Col, *via* the main Rongbuk glacier, and to reach Camp IV again. Their experiences confirmed the judgment of earlier expeditions in not attempting this route. In the succeeding days two parties left Camp VI, but were unable to negotiate the difficult rock below the summit ridge.

The other expeditions were likewise foiled by adverse weather from achieving their objectives. A party of four, organized by *Mr. Waller*, succeeded in establishing a high camp at 24,600 feet on the east face of Masherbrum, and two climbers were able to ascend thence to approximately 25,000 feet, less than 1000 feet from the summit, before the difficult rock and the severe wind obliged them to return. Unfortunately, owing to their camp being buried by sliding snow, they were obliged to spend a day and a night in the open and were badly frostbitten. The attempt had therefore to be abandoned. It was a considerable achievement to have reconnoitred a practical route to the mountain and to have come so near climbing it at the first attempt. Professor Graham Brown gave us an excellent description of the topography of the massif and of the party's exploits, and Mr. Waller has shown us an interesting film.

The *American Alpine Club's Karakoram Expedition*, led by Mr. C. S. Houston, who had been a member of the successful expedition to Nanda Devi, set themselves the task of reconnoitring the approaches to K^2, the second highest mountain in the world. Two parties only had previously climbed on this mountain, and the one led by the Duke of the Abruzzi had succeeded in reaching the Savoia pass, 22,000 feet, in 1909. Having examined the three possible lines of attack, and failing to reach the Savoia pass, the

party finally decided upon the south-east, or Abruzzi, ridge. After three weeks' hard work, despite bad weather, heavy going, and very severe rock work, two climbers attained approximately 26,000 feet, when a threatening storm caused them to descend. The route to the summit appeared to offer no greater difficulties than those already overcome—a promise of ultimate success.

Mr. Ivan Sanderson has given us an account of his recent expedition to Dutch Guiana. He is experienced as a naturalist in tropical countries—you will remember his journey some years ago in British Cameroons—and has evolved an ingenious method for the transport of the necessary equipment. The exhibition of some of his boxes after the reading of his paper attracted much favourable comment. Mr. Sanderson spent a year in the country, and his account dealt not only with its natural history, but also with its geographical features, the life of its varied peoples, and its administration.

Our Gold Medallist, *Mr. Lincoln Ellsworth*, has recently returned from another expedition to the Antarctic, accompanied by Sir Hubert Wilkins, also a Medallist. In January of this year he took his ship, the *Wyatt Earp*, to the edge of the ice barrier off the Australian Antarctic Territory in approximately 78° E. Landings were made on several islands, and one on what appeared to be the mainland; several flights were made by the reconnaissance seaplane, and on the larger plane Ellsworth flew to lat. 72° S.

The R.R.S. *Discovery II* returned in May from her fifth commission in Antarctic waters. This commission was in two parts, the first being a circumnavigation of the Antarctic continent, which was completed by May 1938. On this voyage the Balleny Islands were visited, enabling corrections to be made to the existing surveys, and Adélie Land was sighted. Seven cruises were then carried out, on each the vessel sailing south on the Greenwich meridian to the edge of the pack-ice, thence to long. 20° E., and back to Cape Town. In March of this year the coast of the Antarctic was followed for about 150 miles of barrier cliffs between long. 0° and 4° E.

We hope to publish shortly with Mr. Lars Christensen's paper a map which will show the contributions of British and Norwegian expeditions to the mapping of this quadrant of the Antarctic. The compilation of this map has been made possible through the cooperation of Mr. Christensen, the Hydrographer of the Navy, and the *Discovery* Committee. Interest in the Polar regions is now widespread, and the Council are considering how we can cooperate with His Majesty's Government in securing adequate representation of recent British work in the Polar Exhibition at Bergen next year.

Several expeditions, mostly organized by the Universities, were at work in the Arctic during the year. With the *Imperial College Expedition to Jan Mayen*, led by Mr. Alexander King, the University of London for the first time entered this field of activity. Mr. King took with him a party of nine specialists, including a surveyor, and was able to continue work in an island already known to the Society from Mr. J. M. Wordie's visit in 1921. Despite bad weather and the difficulty of transport in the barren and mountainous island, with its contrasts between lava flows and icefields, the expedition made considerable additions and corrections to the existing surveys, and secured

extensive botanical, ornithological, and geological collections. Three ascents of the Beerenberg, first climbed in 1921 by Mr. Wordie and Professor Mercanton, were made. The Oxford University Exploration Club sent a party to West Greenland, led by Messrs. Sugden and Mott, to complete the observations carried out on two earlier expeditions. From Cambridge, *Mr. L. H. McCabe* led a party to Spitsbergen, and *Mr. H. I. Drever* to Umanak Fiord, West Greenland, where, in addition to geological and archaeological investigations, studies in the psychology of the Eskimo were carried out.

Of the expeditions in the field referred to last year, we have had accounts from *Mr. Haig-Thomas* of his journey in Ellesmere Land, from *Major R. A. Bagnold* of his journey to the Gilf Kebir, and from *Miss Freya Stark* of her recent travels in the Hadhramaut.

Turning now to expeditions still in the field, and to those about to leave, I would mention *Mr. Ronald Kaulback*, who has been joined by *Mr. L. St. C. Bartholomew*, and who is still at work in "The Triangle" on the north-east borderlands of Burma. He has made large collections of natural history specimens, and is also no doubt taking the opportunity to carry on his survey. In the Canadian Arctic Mr. Manning is continuing the work of the *British Canadian Arctic Expedition* which went out in 1936. Mr. Bray and Mr. Baird, who had taken part in the first year's work, went back again last summer, and it was with great regret that we learnt of the death of the former on a boat expedition to Igloolik, Melville Peninsula. On Bray's death, Baird continued to Igloolik with the intention of carrying out their original plan, a journey along the west coast and across the interior of Baffin Island. We hope to publish shortly an account of the early work of Manning's party. *Mr. Eric Shipton* has left to continue the exploration of the Shaksgam valley in the Karakoram, which he began in 1937, accompanied by a surveyor, geologist, and botanist.

Among other expeditions that have recently set out I may refer to *Mr. J. V. Harrison's* geological expedition to the Andes of central Peru, and to Messrs. *R. W. Feachem* and *E. D. W. Leaf's* expedition to the Bay Islands in the Gulf of Honduras for physiographical and archaeological studies. *Mr. J. A. Steers*, a Member of our Council, has left to study the formation of coral cays in the neighbourhood of Jamaica.

From this brief summary it is apparent that British activity in exploration and geographical research in the field shows no signs of diminishing, and I would emphasize the share of the Society in promoting and assisting this work. From the Expedition Fund, which has been re-established by the generosity of several benefactors, and from the general funds of the Society, it has been possible in many cases to make small grants towards expenses. The Society's share however is by no means limited to this direct financial support. The approval of our Council is frequently instrumental in obtaining further financial support for these expeditions. The Society also gives advice on equipment and lends scientific instruments, the purchase of which might otherwise strain the expedition's resources, and the Council have recently arranged to place a room in the Society's House at the disposal of organizers of approved expeditions. Finally, on the return of the expedition, the Society assists in the publication of its results, adequately illustrated, and often

accompanied by elaborate maps drawn by the Society's draughtsmen. These services represent a value many times greater than the actual money grant.

Similarly the Society contributes to the advancement of other branches of geography. While it does not as a body directly initiate or supervise research, it assists those engaged upon a particular subject, promotes discussions on the results obtained, and eventually publishes them. It thus acts as a link between those interested in the various branches of our science. It must also aim at setting a high standard of geographical work in this country. It has thus the duty of assisting in securing the adequate representation of our subject at international congresses and other assemblies abroad. I must pay a tribute to the organizers of the International Geographical Congress at Amsterdam last July, held under the auspices of the International Geographical Union on the invitation of the Royal Netherlands Government, and under the presidency of our past President, Sir Charles Arden-Close. Those privileged to attend have a vivid recollection of the careful organization of the Congress, and of the warm hospitality of their hosts. We are glad to note that at the suggestion of the Society's delegates the British National Committee for Geography is taking steps to extend and coordinate British participation in future congresses. Again, in September last our Secretary, Mr. A. R. Hinks, was named by the Prime Minister as chief of the British delegation to the Fifth International Congress of Photogrammetry at Rome. Despite the uncertainty then prevailing, he spent a profitable time in Rome, and has given us his main conclusions in the *Geographical Journal*.

Again the Society has been able to assist Government and other official bodies in dealing with geographical problems. Last November it submitted to a Royal Commission a memorandum on the geographical aspects of the location of industry, prepared by a committee under the chairmanship of Professor E. G. R. Taylor. The final form of this memorandum was also largely the result of a discussion at one of our Afternoon Meetings. The preparation of this material emphasized the need for a national atlas of Great Britain, and we shall hope that the efforts of the committee sponsored by the British Association, with the cooperation of this Society, will prove successful.

As a geographical society we are particularly interested in the standard of cartographical work in this country. We welcomed therefore the publication of the Final Report of the Departmental Committee on the Ordnance Survey, to which the Society had submitted evidence, and the opportunity of discussing the recommendations at an Afternoon Meeting this session. The recommendations of the Committee, described by the Director-General as "a new charter for the Ordnance Survey," when carried into effect, will very materially improve the mapping of this country, which already sets a high standard for national surveys. They will result in all ordnance sheets being arranged on national in place of county line, and having a grid with the international metre as the unit. The continuous, rather than the periodic, revision of the 1/2500 map was strongly recommended, as was the issue of a new map on the scale of 1/25,000 or approximately $2\frac{1}{2}$ inches to the mile, which will be welcome not only to official users, but also to students and teachers of geography. Their suggestion that the Government should consider the

establishment of an air survey unit to fulfil the requirements of the survey will also be welcomed.

Fellows of the Society therefore have the satisfaction of knowing that by their support they are enabling it, apart from the more direct benefits they derive from their Fellowship, to continue to promote work of this character. The Society is by charter a body open to all those interested in the advancement of geographical knowledge, and is not confined to those able themselves to undertake exploration or research. In times such as the present it is vital that this work should be continued. We regret therefore that the strength of the Society has not been maintained in the past year, although the number of Fellows elected was appreciably larger than in 1937. I would urge the necessity of doing everything possible to maintain and increase our numbers. The Council are alive to the necessity of extending the work and interests of the Society, and they have recently received the report of a committee appointed, under the chairmanship of Sir Francis Younghusband, to consider how this can be done most effectively.

To Fellows of the Society we offer varied attractions. The attendances at our meetings show that they are appreciated. In the last year the papers at our Evening Meetings have dealt with exploration and travel in every continent. In addition to those already mentioned, I may remind you of Dr. Donald Thomson's excellent account of his experiences among the natives of Arnhem Land, and of Sir John Russell's description of Italian colonization in the Pontine marshes and Libya. We have also shown a number of films, many in colour, at Afternoon Meetings. Current geographical work in several branches of our subject has also been described and discussed at our research meetings. I would strongly urge those Fellows who habitually introduce members of their families or friends as guests at these meetings to endeavour to interest them in the work of the Society and to enrol them as Fellows. Each year the number of those attending our meetings and visiting our House grows, and it is important that as many as possible of those who are simply visitors should become Fellows. In addition to these meetings, we maintain a well-equipped House—to which Fellows can introduce their friends and entertain them to tea—with an extensive library, map room, and photograph collection. Finally in the *Geographical Journal* we have what is generally recognized to be the leading geographical publication in the world. Besides publishing with maps and illustrations the papers read to the Society, it records the progress of geographical science and reviews the current literature of our subject. Through it those unable to attend our meetings are kept in touch with the work of the Society.

A decline in the strength of the Society is at once reflected in its financial resources, and thus in a restriction of these activities. During the past year, also, additional expenditure has been incurred in carrying out air-raid and fire precautions in the Society's House. Should the present threat pass, these measure swill not be entirely profitless, for they will afford protection against the ordinary risks of fire.

Happily, through the generosity of several benefactors, it has been possible to re-establish the Expedition Fund, and to start a Special Publications Fund to enable contributions of particular value to be published in a fitting style.

The importance also of building up an adequate endowment fund to increase the stability of our finances has frequently been emphasized. I would strongly commend all these to the generosity of those interested in our work and anxious for its extension.

Many of you are aware that our Secretary, Mr. Hinks, had intended to retire from office at the end of this session, but I am glad to say the Council have persuaded him to postpone his retirement for a year, and in the meantime have been able to grant him four months' leave, which he hopes to devote to completing a book on map projections. The Society is indebted to Mr. Hinks for volunteering to come back and do all he can to help in case of a national emergency.

RECENT RECONNAISSANCE FLIGHTS IN THE ANTARCTIC

LARS CHRISTENSEN

Evening Meeting of the Society, 29 November 1937

AS I have this evening the honour of addressing the Royal Geographical Society it is perhaps not unfitting to recall to mind that it was a Briton, Captain James Cook, one of the world's bravest and most capable navigators, who led the first planned Antarctic expedition, the British Admiralty having in 1772 sent him out with orders "to discover the great Southern Continent or establish that it did not exist." It was also a Briton, Biscoe, who was the first human being to behold the Antarctic continent, and it was the Englishman Sir Hubert Wilkins who on 16 November 1928 performed the first Antarctic flight. And men like Sir James Clark Ross, William S. Bruce, Robert F. Scott, Sir Ernest Shackleton, and Sir Douglas Mawson have maintained and further extended Great Britain's honourable traditions in South Polar exploration.

Among the rich British literature on polar subjects there are perhaps two works especially which have found many readers in Norway: Hugh Robert Mill's 'The siege of the South Pole,' and J. Gordon Hayes's 'The conquest of the South Pole.' These two titles in themselves contain as in a nutshell the history of the Antarctic for the last one hundred and fifty years: the siege of the South Pole in the nineteenth century and the conquest of the South Pole in the twentieth.

The interest of the general reading public, as regards Antarctic exploration, has perhaps first and foremost been concentrated on the conquest of the South Pole itself, the purely sporting element in polar work. But through this interest in the sporting element the interest of the public has also been awakened for the manifold practical and scientific problems which polar explorers have set themselves, problems which, thanks to the excellent technical resources we now dispose of, will make it far easier for us to solve than for our predecessors.

The scientific work which is carried out in the Antarctic is of course not merely geographical, but comprises also important geological, biological, and oceanographic investigations. But the geographical work is the primary. For, as Sir Charles Close said in January 1930: "The very foundation of all our work is the exploration of the world's surface and the expression of the result of this exploration in maps." And my last voyage to the Antarctic in the winter of 1936–37 was entirely devoted to cartography.

I have undertaken four trips to the Antarctic since 1930. They have been a combination of business voyages and expeditions with a scientific and geographical aim. I have also been impelled by the love of adventure, a quality which in no small degree I have inherited. I have in addition during the past ten years sent five other expeditions to the Antarctic, solely with the object of solving scientific and geographical problems. There was the *Odd I* expedition in 1926–27, and four *Norvegia* expeditions in the period 1927–31. The object of the trip to the Antarctic last season was by the aid of air

photography and electrical soundings to improve the maps of the lands discovered in the course of my previous expeditions.

For centuries explorers or adventurers have gone southward towards the 40th and 50th degrees of latitude in the hope of finding *terra australis*, a land which they thought was flowing with milk and honey, or better still consisted solely of precious metals. It was only a question of getting sufficiently far to the south. But, instead of inconceivable riches, all that was found was bad weather, fog, snowstorms, and ice: prodigious quantities of ice. Now and again it happened also that among the ice mountains there was discerned something which it was thought must be land, but in most cases it was merely the sheen given off by the "blue ice" of the mountains or the peculiar light-dispersion which transformed an island of ice into an apparent island of rock and hill. Nevertheless, it happened sometimes that the sight of land was not a *fata morgana*, and during the three hundred and forty years which lie between the discovery by Columbus of the American continent in 1492 and by Biscoe in 1831 of the Antarctic discoveries were made of South Georgia, South Shetland, the South Orkneys, the South Sandwich Islands, Bouvet, Peter I, and Alexander I Islands. The discovery of these islands however did not lead to any overwhelming acquisition of riches, but only to comparatively large catches of seals and right whales by British and American whaling companies. Among these was the celebrated firm Enderby Brothers of London, which in 1830–31 had two vessels in the Antarctic, the *Tula* of 150 tons with a crew of sixteen, under the command of Captain Biscoe, and the *Lively* of 50 tons with a crew of nine, commanded by Captain Avery.

It was on 2 March 1831 that Biscoe sighted Cape Ann, and this was the first time any human eye had seen a patch of the Antarctic continent. A Briton was the first who saw the continent, but the first actually to tread this mighty continent was a Norwegian, Henrik Johan Bull, who on 24 January 1895 undertook a landing at Cape Adare at the easterly inlet to the Ross Sea.

I shall not go into any further details with respect to the history of Antarctic exploration, and the facts I have mentioned have been recalled to mind only for the purpose of giving the proper perspective to my narrative. On the other hand, I should like to say a few words about the contribution of my native town, Sandefjord, to Antarctic exploration. It is forty-five years since my father in 1892 sent Captain C. A. Larsen with the sealing vessel *Jason* from Sandefjord southwards to what is now called the West Antarctic Archipelago to catch right whales. In the following years he sent Larsen and the *Jason* southwards again, together with the sealing vessels *Hertha* and *Castor*. These two *Jason* voyages were from a business standpoint not very successful, but they performed a fundamental geographical pioneer work in those waters where they hunted for whales and seals. Further, it was the experience from these two *Jason* expeditions which ten years later led to the start of the great Norwegian Antarctic whaling. European adventurers for centuries had voyaged to the South Polar seas in the hope of finding the land of good fortune and riches, but they had all been disappointed. Nor were there many who in the autumn of 1905 believed that my father would spin any silk out of sending a whaling expedition with factory ship to the West

Antarctic Archipelago. But fortune followed our flag on that occasion, and whaling in the Antarctic has been a big source of income for Norway during the past thirty-two years. There have been caught in the Antarctic 430,935 whales in all.

From 1905 to 1925 all whaling in the Antarctic was concession whaling dependent upon England, and the field was restricted to the western Antarctic group of islands and the inner Ross Sea. From 1925 down to the present day however the concession whaling has been superseded by the immense pelagic whaling and the field has been extended in such wise that it stretches from long. 80° W. to 180° E. It was in connection with this great change in the whaling industry that I, during the period from 1926 to 1931, sent out the *Odd* and *Norvegia* expeditions already mentioned, and from 1930 to 1937 personally undertook four voyages to the Antarctic.

The Antarctic is vast, its problems are many and far-reaching. As regards my own expeditions, they have been conceived as a Norwegian contribution to that work of investigation and discovery which has been carried on so intensively during the twentieth century. The map (following p. 272) shows what the Norwegians have discovered in the way of unknown land in the Antarctic in the course of the last ten years on the coast from long. 86° E. to about long. 17° W. All the Norwegian names on my maps were proposed by my men. Commencing with the west we have the names Dronning Maud Land, with Kronprinsesse Märtha Land, Prinsesse Astrid Land, Prinsesse Ragnhild Land, Prins Harald Land, Kronprins Olav Land; east of Kemp Land we have Lars Christensen Land, Ingrid Christensen Land, and Kong Leopold og Dronning Astrid Land.

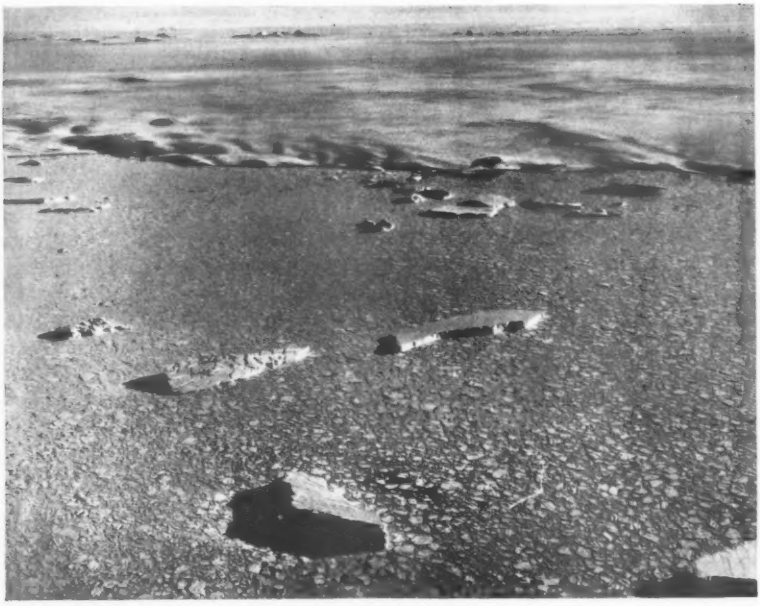
This result was far more than we had expected, and therefore we might well have been content with what had been accomplished. But something was lacking: the newly discovered stretches were not adequately mapped, and as long as that remained undone I felt that I had not completed the task I had set myself. Therefore in December 1936 we again made our way southwards with the object of gathering by photographic means the material for mapping those regions of the eastern Antarctic which had been discovered by Norwegians: an alluring task, by the aid of modern implements and modern methods to improve the maps of regions so far away, but yet so intimately connected with Norway.

Those taking part in the expedition were, besides myself, my wife and youngest daughter, two guests, the airman Viggo Wideröe, and wireless operator and air photographer Romnæs, the mechanics Strandrud and Fidjeland, and the photographic expert Erik Simensen. I had also with me Captain Klarius Mikkelsen, who discovered Ingrid Christensen Land in 1935, and Nils Larsen, who took part in all the *Norvegia* trips. For carrying out the flights a Stinson aeroplane was hired, model 1936, with a 350-h.p. engine and a radius of action, when the plane was equipped with a spare tank, of about 1200 kilometres.

The work was to be done in the same way as during the Norwegian Greenland expedition and during the Svalbard mapping in 1936, by oblique photography. Before commencing each series of photographs the interval of time between each exposure was set by means of an automatic cover-meter, so that

The Framnes Mountains, Kemp Land, looking eastwards

The Framnes Mountains from the coast near the Thorgaut Islands



Pack-ice off Enderby Land

Proclamation Island, Enderby Land

all photographs in the series overlapped by 60 per cent. With such an overlap, the pairs of photographs can be viewed stereoscopically, and it is then possible by means of plotting machines to make an accurate plot of the coast and the land within.

The plane was, for the sake of safety, equipped with a double set of transmitters and receivers, one long-wave transmitter working on 918 metres and a short-wave transmitter with a wavelength of 96 metres. Not once during the forty-four flying hours in which the plane was in action in the Antarctic did the installation show any sign of failing. It was however no less important that the safety service on board the mother ship, the *Thorshavn*, should be as perfect as possible, and therefore nothing was spared in the direction of wireless equipment there. The wireless equipment is really deserving of more detailed mention than we can give here, since, as the airmen said," We hang during all flights on the wireless and the engine." They meant that a perfect wireless service during the flights was the most important of all. Even if the engine struck, they would have time, by wireless, to inform us of their direction, so that the chance of being saved was very great, even if the aeroplane was damaged.

It had previously been necessary to be content with inserting on the maps the coast and certain mountain tops according to bearings taken from an aeroplane or vessel. It was the intention now to try to draw up a detailed map both of the actual coast-line and of the land itself in the immediate vicinity of the coast. The airmen were to navigate as accurately as conditions would permit and to determine the position of prominent headlands on the coast, outstanding mountains, and any other marked feature of the landscape.

On 28 December 1936 our expedition set out from Cape Town by the *Thorshavn* southwards towards the field, in order as usual first to deliver fuel oil to the whalers and take whale oil in return. The first floating factory which we should board according to the plan was my firm's *Ole Wegger*. We reached her only on January 14, having made a detour to Kerguelen Islands.

According to the logbook, the *Thorshavn* met the *Ole Wegger* in about lat. 62° S. and long. 86° E. While these exchanged oils, the *Ole Wegger's* spare whaling boat, the *Firern*, was made ready to take on board the aeroplane, the airman Wideröe, and the photographer Romnæs, in order to carry them as near as possible to the Barrier. The whaling boat had been equipped at home in Norway with a crane aft in order to set the aeroplane easily on the water and take it on board again, an arrangement which proved to be very serviceable.

There is a saying to the effect that "man proposes but God disposes," and we had a taste of this in transferring the plane, as it got caught in the rigging of the *Firern*, with the result that the horizontal rudder crumpled up and the tail got bent. We all pulled a long face, but fortunately it was possible to repair everything, thanks to the welding shop on the *Ole Wegger*. Nevertheless I could not help reflecting how small an accident was needed in order to upset all our plans.

The plan for the first days was as follows. The whaling boat *Firern* was to proceed southward with the aeroplane and the airmen to the Shackleton Barrier, and thence towards the north-west, regularly taking photographs

from the air. When we in the *Thorshavn* had completed the delivery of fuel, and taken over the oil from different floating factories, she was to join up with the *Firern* as mother ship.

On January 20 and 21 the *Thorshavn* was back alongside the floating factory *Ole Wegger*. One of the harpooners told me that he had noticed that a killed whale touched the bottom with only about two lines out. We cruised with the echo-sounder over the position he had mentioned and found bottom at 310 metres, where the nearest cast of the lead showed about 3600 metres. The new bank was given the name of the Gribb Bank, after his whaling boat the *Gribb*.

The aeroplane, the airmen, and Mikkelsen had been transferred to the whaling boat *Firern* on January 15. On January 24 I received the first report from them. They had all along had unsettled weather with breeze and snow-haze or fog. Instead of commencing their investigations outside the Shackleton Barrier, the *Firern* had therefore been steered westward. After cruising for three days they had arrived off Ingrid Christensen Land, whence they had proceeded a little to the north and east, so that they now lay off King Leopold and Queen Astrid Land, which was discovered in January 1934, on the third *Thorshavn* expedition. From here Wideröe and Romnæs undertook a flight and photographed the whole West Barrier. This passes directly into the inland ice, so that no bare land was seen. The Barrier was measured where it takes to the sea, and was there 75 metres in height. It was found also that the Barrier does not rest on the bottom everywhere, but floats in places. Occasionally pieces break loose and float out as icebergs, which may completely alter the coast-line.

The *Thorshavn* had now quite finished with the *Ole Wegger* and went to join the *Firern*. On January 25 we sounded from the *Thorshavn* an unknown bank in the middle of Olaf Prydz Bay. While the depth in the bay otherwise varied from 800 to 900 metres, that over the bank was barely 150 metres. We gave it the name of The Four Ladies Bank, after our four lady comrades of the voyage.

In the afternoon of the same day, January 25, we met the *Firern*, which was then lying in a big ice harbour off Ingrid Christensen Land, discovered by Klarius Mikkelsen on the *Thorshavn* in 1935.

It is simple to say that we met the *Firern*, but when one sees a photograph of the pack-ice through which we had to force a way it will be understood that it is not always such an easy matter for all that.

On January 27 we had brilliant weather, ice around us, but dead calm. The plane made four trips, the first eastward up to the point where the West Barrier commences to swing to the north, and from here the first regular photographic flights commenced.

The plane landed, filled up with petrol, and then proceeded towards the south-west, towards the base at Sandefjord Bay, over the solid sea-ice, pack-ice, and icebergs in thousands. Some of the bergs off Ingrid Christensen Land had a height of between 50 and 75 metres. Small skerries dotted nearly the whole coast. The base of Sandefjord Bay was covered with solid sea-ice, with a number of frozen-in icebergs.

In the background were the previously discovered Sjövold Mountains,

which the discoverer, Harpooner Sjövold, asserted were volcanic. He must however have mistaken for volcanic smoke the streamers of cloud which sometimes lie for hours at the height of the mountain tops. We later saw a typical example of this over the Framnes Mountains on Kemp Land.

From the base of Sandefjord Bay the airmen took photographs towards the east past the Larsemann Mountains, which consisted of big mountain masses, partly covered with ice and snow, and farther past the Ranvik Mountains. A curious feature of the coast here was the number of small lakes of fresh water up in the mountains, quite open and without any indication of ice, either on the surface or round the edges.

Wideröe and Romnæs then undertook a trip, with my wife as passenger, over Ingrid Christensen Land, where she threw a flag down on to the land.

On the third trip Mrs. Rachlew and I went as passengers. It always gives a curious feeling to look out over land which only ten or twelve other people have seen. Soon however all other feelings were pushed aside in admiration of the wild beauty of the landscape. The view across the Vestfold Mountains especially was one of dazzling beauty.

As the weather was sunny and fine, we also wanted to try to get ashore. We boarded a motor boat which we had with us for this purpose, but before we had rounded the bow of the *Thorshavn* the sea got up and the waves beat over the boat so that we were thoroughly drenched: so quickly can the weather change in the Antarctic from perfect sunshine and calm to storm. We took the reasonable course and returned to the *Thorshavn*, where we all experienced great trouble in getting on board again on account of the heavy sea. But we managed somehow, for, as Captain Mikkelsen used to say, "Things generally turn out all right."

We had however to see that we got out of the ice, which threatened both ship and cargo, as quickly as possible, so a course was set to the north towards Lars Christensen Land. We took continual soundings where the chart was blank, and ascertained, moreover, that the Barrier from Sandefjord Bay, north to Thorshavn Bay, must be placed about 12 nautical miles farther north.

In Thorshavn Bay we found a fine aeroplane harbour, and a couple of flights were undertaken on January 28 to photograph Lars Christensen Land. The first trip was easterly, along the Barrier towards Sandefjord Bay, where the plane had to turn back owing to a snowstorm. The second was in a westerly direction, to the Gustav Bull Mountains, where on the southern side a new height of 1050 metres was observed. From the Gustav Bull Mountains photographs were taken towards the east to Thorshavn Bay.

We were anxious to try a landing, and when we lay off Gustav Bull Mountains, on the evening of January 29, all was made clear for the attempt.

On 30 January 1937, at 2 o'clock in the morning, I had the great joy of setting foot on the Antarctic continent, where we laid down a depot. Klarius Mikkelsen Mountain was a peculiar mountain, with precipitous, fissured sides; the silence was almost uncanny: only the even beat of the waves and the unceasing faint cackling of the penguins broke the solemn stillness.

The following day, January 31, we had a very unpleasant experience early in the morning. The sounding apparatus showed suddenly (from a depth of

water of 260 metres) only 15 metres. The captain telegraphed "Stop" to the engine room, but stood by and waited for the worst. Fortunately, we slid over. "You know," he afterwards said to me, "the vessel draws 28 feet, and we must have 2 feet extra for the log. So we had only 4 metres of water to go on in this sea." "Nils Larsen," I said, "things generally turn out all right." But I knew very well that a shiver ran down our spines.

After having passed a belt of pack-ice, the *Firern* found on January 31 open clear water, between Kemp Land and Enderby Land. The aeroplane was made ready and Wideröe and Romnæs started. They had been under the impression that we were close up under land, but the assumed land proved to be only a gigantic iceberg. The plane set a course towards the Framnes Mountains on Kemp Land, and the photography was commenced there.

This maintained the connection with the most westerly section of the flights made on January 28. Big mountain chains and peaks were observed. The coast of Kemp Land consists of big bays and innumerable islands. The flight extended over a distance of 800 kilometres. Wideröe would willingly have undertaken a long flight inland, but unfortunately the clear stretch had closed towards the evening, so that the *Firern* had to seek open water.

We had now arrived at February 1 and could no longer have the *Firern* available. The plane, the airmen, and Captain Mikkelsen returned to the *Thorshavn* and the *Firern* returned to the *Ole Wegger* under the command of her own captain.

Before she left us on February 1 however Wideröe had got in seven flying hours in the course of the morning, and had flown 1400 kilometres; 400 kilometres of the coast-line from long. 58° E. to the west of Proclamation Island were photographed, so now the whole coast from the West Barrier to Enderby Land, or in all about 1600 kilometres, was photographed for mapping The first stage was completed.

On February 2 we passed Cape Ann on Enderby Land, and as we did not find open water in the pack-ice, which was unusually dense here, we continued our westward course to Queen Maud Land. The plane started here on February 4 with my wife as passenger. She showed herself moreover to be both an able and successful observer, as on this trip unknown land was found between long. 40° and 34° E., and lat. 69° 30′ S. The Norwegian flag was thrown out at long. 38° E. and lat. 69° 30′ S. The land has subsequently received the name of Prince Harald Land after the Prince of Norway. The wind stripes in the snow on the sea-ice off Prince Harald Land seem to show that the direction of wind here is fairly constant at this time of the year.

The position of the *Thorshavn* the next day was long. 34° E. and lat. 67° 50′ S. Two flights were undertaken. There was a heavy swell, so that the third officer, who commanded the lifeboat which assisted the aeroplane in the starting and landing, said, when he came on board again, "I did not see the plane at all on account of the waves." Wideröe also said that he would never have thought it possible to start and land in such a swell if he had not experienced it personally.

During the first flight on February 5 the whole of the newly discovered land was photographed from long. 40° to 34° E. It consists of a chain of

The Thorfin Islands, off Kemp Land

Glacier descending to coast of Prince Harald Land

Prince Harald Land, photographed from 7000 feet in longitude 39° E. approx.

Kjerka, a peak discovered in Lars Christensen Land

Icebergs off Ingrid Christensen Land

Glacier on coast of Kemp Land, west of the Thorgaut Islands

mountains, some of them intensely red. The airmen also ascertained that Thorshammer Islet must be removed from the charts, as it does not exist.

The second trip took place over Princess Ragnhild Land, discovered by Riiser-Larsen on 16 February 1931. On this flight only ice barriers were seen. While the airmen were up, the *Thorshavn* proceeded at slow speed in a big circle and in this way kept the small ice away and the stretches of clear water open for landing on the return of the plane.

I find an entry in my diary, February 6: From my office I have to-day received the following telegram: "The *Thorshavn* must be discharged and free to load again at Aruba on March 31." Thereby it was made clear that in the near future we must proceed to the port of discharge, *via* Cape Town.

The last flight was undertaken on February 6. Our position was 69° 15′ S. and 26° E. The plane set a course inwards towards the inland ice. At first the airmen saw only barriers, but suddenly they caught a glimpse, far in on the inland ice, of a long continuous mountain chain. A course was set towards the mountains and new mountain formations continually cropped up, which finally proved to form a mighty continuous chain of mountains over 300 kilometres in length and apparently up to 3000 metres in height. The mountain chain lay however 120 English miles from the edge of the ice, so it was not so strange that nothing had previously been known of it, and that it was possible to get a wrong impression of the profile of the land.

I was sorry and disappointed not to have time to prospect Crown Princess Märtha Land. I received however unexpected assistance from my floating factory, the *Thorshammer*. She was operating in 59° S. and 20° E. when stormy weather came on, and as the whaling boats required bunkering the factory ship proceeded in a southerly direction towards the edge of the ice, and on February 6 I received the following telegram from the manager: "Position to-day 69° 39′ S., 8° 28′ E. Sounding with echometer 2180 metres. Land visible about 60 nautical miles to the south. Possibly a large island, as the land slopes slightly down to the pack-ice at both ends." When we on the *Thorshavn* went to prick out the position on the chart, we found that the *Thorshammer* lay far inside the coast, and we were compelled to believe that 69° S. was a telegraphic error for 59° S. However on the 7th we received a new telegram which confirmed the previous one.

Then on February 7 the *Thorshavn* finally turned her nose homewards. All the flying had been done during the period January 16–February 6, forty-four flying hours in all and over stretches of 10,000 kilometres, the whole time without accident. Two thousand two hundred photographs were taken with the mapping camera, in addition to individual photographs and films.

The cooperation between the *Firern*, the plane, and the *Thorshavn* had shaped itself just as we had hoped. Without the large camera the plane would not have been able to effect anything very great. Without the plane, our knowledge of the east coast of the Antarctic continent would still have been superficial. The experience of Captains Mikkelsen and Nils Larsen and their great interest in our work were of invaluable assistance. The flying and photography were carried out in an absolutely masterly manner.

When we set out homewards on February 7, the position of the *Thorshavn* at midday was 69° 30′ S. and 20° 43′ E. It was not far from the position in

which Biscoe lay when on 5 February 1831 he noted in his log that he believed that he had seen land. We lay one degree more southerly than Biscoe. Biscoe cannot therefore have seen any land from there. Biscoe saw land, as previously mentioned, only on March 2 at Cape Ann on Enderby Land.

Also in another connection I came to think of Biscoe. In the case of all my expeditions, all those taking part had returned safely home. Such was not the case one hundred years ago. In the middle of March 1831, the *Tula* and *Lively* got separated by heavy storms. Biscoe's own vessel, the *Tula*, arrived at Hobart, Tasmania, on 10 May 1831, but then only Biscoe himself, two of his officers, and the ship's boy were able to work. All the others were so ill that they could not stand on their feet without assistance. The carpenter was however the only one who had died. On board the *Lively* the position was still worse. When she stranded at Port Phillip, afterwards Melbourne, of the whole crew only the captain, one seaman, and one small boy were alive. All the others, seven men, had died.

Modern technique has now placed us in a position, with almost complete certainty, to master the moods and humours of the sea and ice, and modern physiological chemistry has, practically speaking, removed the bogey of scurvy from the list of accidental misfortunes on polar expeditions. But I should like to say this, that the more free from danger we to-day can work in the Antarctic, the greater is our admiration and respect for men like Biscoe, Avery, and all the other brave, noble, and patient men and pioneers in the Arctic and Antarctic. If we by our work have been able to honour the memory of these men, no matter to what nation they belonged, I am satisfied.

Before I conclude, I should like to give a very brief résumé of the results of the nine expeditions I have sent out to the Antarctic regions, four of which have had aircraft at their disposal.

Apart from the more casual expeditions of the *Torlyn* in 1931 and *Thorshavn* in 1935, the distance sailed by the expeditions in the South Polar seas may be estimated at 65,000 nautical miles, or approximately three times the length of the equator.

With regard to the results of the expeditions, reports of these and of the more important geographical results have been published from time to time in various geographical journals and in book form. The cartographical results have been used for drawing ocean charts. The scientific material which has been collected is being dealt with by experts and will gradually be published in a special series by the Norwegian Academy of Science, Oslo. Of this series, which is being edited by Professor Holtedahl, seventeen treatises have so far appeared, dealing with oceanographic, geological, botanical, and zoological subjects, totalling altogether 868 pages.

In the way of surveying work, a stretch of coast of about 4000 kilometres in length has been delineated, of which about 2000 kilometres has been photographed by mapping cameras. The number of photographs is quite two thousand, which will, it is hoped, permit drawing maps covering a coastal strip of about 80,000 square kilometres. These photographs have been presented to the Norwegian Geographical Society, who have commenced working out new maps.

The expeditions have also carried out a considerable amount of work in

the way of ocean surveying and sounding. A large number of soundings have been taken, and a material contribution has thereby been made to the knowledge of depth-conditions in the Antarctic. Two series of soundings were taken round the whole of the Antarctic continent by the *Norvegia* in 1930–31 and *Thorshavn* in 1933–34. A series of banks were found: The Gunnerus Bank, Maud Bank, Fram Bank, Storeggen, The Four Ladies Bank, Gribb Bank, Sars Bank.

Meteorological and oceanographic investigations were carried out more especially in the *Norvegia* expeditions of 1927–28, 1929–30, and 1930–33, and on the *Thorshavn* expedition in 1933–34. On these expeditions, 155 oceanographic stations were made in all, most to a depth of 1500–2000 metres. At each sounding, samples were taken from all standard depths for determination of the salt content of the water and its temperature. On the last-mentioned expedition, samples were also taken to determine the oxygen content of the water. Regular meteorological observations were made every third or fourth hour, and also observations of temperature and salt content of the water at the surface, so that the reciprocal action between air and sea might be studied. Thousands of samples of water from the surface of the sea were also taken.

Only the material from the first two expeditions has been finally dealt with. Certain conditions in connection with the reciprocal action between air and sea have been fixed. A large cyclonic current system has been shown in the Atlantic part of the Antarctic Ocean where these two expeditions have worked, and this current system appears to be caused by a corresponding wind system.

My two expeditions which circumnavigated the whole polar cap also made material contributions relative to the meteorological and oceanographic conditions along the whole of the Antarctic continent. During the international polar year 1932–33, three of my floating factories, the *Ole Wegger*, *Thorshammer*, and *Solglimt*, took part in the world-embracing meteorological work which was at that time being carried out.

With regard to the geological results, it may be mentioned that it was on these expeditions that samples of rock were collected for the first time from Peter I Island, from Clarence Island in the South Shetland group, from Bouvet Island, and from Ingrid Christensen Land. Geological studies were undertaken at South Georgia, Deception Island, and in the West Antarctic Archipelago, and a contribution has been made to the knowledge of the rock foundations, forms of landscape, and conditions of ice covering of these regions. Of particular interest are the evidences that the physical geographical conditions in the western Antarctic region mentioned at the present time may be regarded as entirely on a parallel with those we have had in the Norwegian coastal regions during a part of the Ice Age, and therefore throw a light on the geological history of Norway.

The zoological material is very comprehensive, both as regards the bottom fauna at various depths and plankton, and also the higher animal groups, fish, fowl, and mammals (seals). The material is partly collected from localities which have hitherto been little or not thoroughly explored, *e.g.* from Peter I Island and Bouvet Island. It has been handed over to the University Zoological Museum at Oslo, and most groups are still being dealt with by Norwegian and foreign specialists. So far, nine zoological works have been published.

When the material as a whole has been completely dealt with and the results published, it will form a considerable contribution to our knowledge of the animal life of the Antarctic.

It seems to me both natural and proper in concluding this address to extend my warm thanks to all those who during these years and in the course of these expeditions have contributed their best towards making the result successful. I mention none by name, but all are remembered, none forgotten.

DISCUSSION

Before the paper the PRESIDENT (Professor HENRY BALFOUR) said: We opened our session with a visit to the Antarctic regions, and to-night we are going back there. There has been astonishing activity in that region, and on this occasion we have been fortunate enough to secure Mr. Lars Christensen, a Life Member of our Society. He has visited the Antarctic on at least four occasions, and on each he has been accompanied by his wife, whom we are glad to see with us this evening.

Mr. Lars Christensen is a great magnate in the whaling industry: I might describe him as a leviathan among the whaling fraternity; he is, however, a great deal more than that because he has used the opportunities which his industry affords him for prosecuting scientific researches. That has been one of the main objects of the numerous visits which he has paid to the Antarctic and of the numerous expeditions which he has sent there. You will all wish to welcome him and Fru Christensen very cordially. I now ask Mr. Lars Christensen to give to the meeting an account of his latest expedition.

Mr. Lars Christensen then read the paper printed above, and a discussion followed.

The PRESIDENT: We are honoured by the presence of the Norwegian Minister. I am sure you would like to hear him.

H.E. The NORWEGIAN MINISTER: I ought first to thank Mr. Lars Christensen for his lecture and for everything he has shown us, but being myself a Norwegian I feel I cannot do that without having emphasized and underlined the expression of thanks he offered this Royal Geographical Society. I feel quite certain that he meant what he said with all his heart. Nowhere could a Norwegian explorer, a Norwegian business man, combining so happily an interest for scientific work and exploration with first-rate business acumen, be more in his right place than in this country and in its capital.

Just recall the map he let us see. You saw all round the South Pole, all round the continent of the Antarctic, a number of British names interwoven with the names of Norwegians and Norwegian place-names. If you looked to the corners of the map you saw South Africa, New Zealand and Australia, and, in the lower corner, South America linked up with Antarctica by a number of British names —South Georgia, the Falkland Islands, the South Orkneys, and South Shetlands. Where, I repeat, could a Norwegian explorer of the Antarctic feel so at home, and where could he expect greater interest to be shown in his explorations than here? The applause you accorded him proved that he was not wrong in his anticipation that coming here would be the right thing to do.

Having said that, I feel that in spite of my nationality I may be allowed to offer also, on my own behalf and on behalf of you all, our very warm thanks to Mr. Lars Christensen for the lecture he has given us to-night. I have read a number of books dealing with polar exploration and have learned about various expeditions, Norwegian and English, and I have seen a number of good maps

and an immense number of beautiful photographs, but, notwithstanding, every time I hear such a lecture as that to which we have been listening I feel deeply moved. Here is something I understand although I never was in the Arctic or the Antarctic. I feel it in my blood. It belongs to our race, this work of exploration. You British and we Norwegians feel that this is our domain; that here we have something to do. We have done it in the past; we are doing it now, and we shall continue.

Please do not believe that it is just a pleasure trip when Mr. Lars Christensen takes his family with him and goes down to the Antarctic on board one of his own first-class ships, equipped with all that modern science and technique can give. He very modestly explained that everything was so simple because there was no moment of real risk in it, but I think that those of this country will understand what it meant to spend months in that part of the world, to go up into or over the ice-fields we have just seen on the map, with nothing but a little tiny ship as the link between themselves and the rest of the world. I think there is more than just the desire for sensation, much more than a desire for a happy holiday, that has driven Mr. Lars Christensen to make his four expeditions and to send out five other expeditions in the course of the last ten years. He feels in his blood that he must do it, that there is something that belongs to him, to have seen, to have done it, to have gone in for it, to be able to talk about it, and to get other peoples interested in the Antarctic. That is why I thank Mr. Lars Christensen, in the name of you all here present, British and Norwegian, because he is one of those who know how to work in our spirit and to do it in such a way that we are proud of him.

Dr. H. R. MILL: After the eloquent speech by the Norwegian Minister, there is nothing left for us to do but to agree most heartily with all he said with regard to the sympathy in the blood of the two peoples of the North. I myself, coming from the extreme north of Scotland almost within touch of Norway, have always felt that a Norwegian is perhaps a little more akin to me than an Englishman.

It has always been one of the greatest privileges and pleasures to hear the Norwegian explorers of the North and South as they have addressed us in this Society, from the time of Nansen down to the time of Mr. Christensen, who has elicited more envy in my mind than almost any other traveller who has spoken to this Society. One must envy a man who has been able to gratify the dream of his youth by carrying out these explorations, going where no man has ever been before, and utilizing methods, designed simply for sordid money making, to advance knowledge and to enhance the glory of geographical discovery and science.

The PRESIDENT: We have had not only a most instructive but a wonderfully illustrated account of part of what the Norwegians have been doing in the Antarctic. You saw the map as it was not so very many years ago and you have seen it as it is to-day. You have realized how the periphery of that vast Antarctic continent is gradually becoming perfectly defined. I think you have also realized to the full how much of the work of exploration and survey has been done by the Norwegians. Mr. Christensen has illustrated the extremely happy union of commercial enterprise and scientific research. One can only hope that other commercial industries will realize how, with the facilities which are offered by the industries themselves, it is possible greatly to advance scientific knowledge. We all have to thank Mr. Christensen not only for his lecture and the admirable way in which it has been illustrated, but also for having followed the traditions of his father in utilizing the mechanism associated with the whaling industry for purposes of scientific advancement. I ask you to express our cordial thanks to him and to Mrs. Christensen, who did so much of the work in flying.

THE COURSE OF ANTARCTIC EXPLORATION BETWEEN LONGITUDES 20° W. AND 110° E.: *Notes on the map compiled to accompany the paper by Mr. Lars Christensen*

IN conversation with the Secretary on the morning after his paper had been delivered, Mr. Lars Christensen agreed that publication should be delayed until a map could be prepared which should show the respective contributions of Norway, Great Britain, and others to the mapping of the Antarctic Quadrant between long. 20° W. and 110° E.

During the last ten years there has been great activity in this section of the Antarctic. The work of various expeditions has been often simultaneous, the areas which they have visited have overlapped, names have been given by both parties, and there is no map which shows the results on a single sheet. The map now published with Mr. Lars Christensen's paper is the first attempt to do so. We have tried to show by the use of colour the authority for the first reasonable delineation of each part of the coast, the points at which landings have been made, the names which have been proposed for different features or areas, and to give reference to the places in which the first publication of this information was to be found. Mr. Christensen very kindly undertook that on his return to Norway he would see that as full details as possible should be sent to us of the Norwegian work, with bibliographical references. In due course we received from Captain Hansen, acting on behalf of Mr. Christensen, a set of the maps of the Norwegian Whaling Association brought up to date in 1937, and a list of the Norwegian landings with references to descriptions and photographs published generally in the proceedings of the Norwegian Geographical Society. One of the Society's draughtsmen, Mr. H. F. Milne, made a careful compilation of all the material from the papers by Sir Douglas Mawson published in the *Geographical Journal* and *Geographical Review*. The Hydrographer of the Navy very kindly gave us permission to make tracings of certain charts recently communicated to his Department from the *Discovery* Committee showing the work of the R.R.S. *William Scoresby* in that area in 1936. We already had in the Society's collection three charts prepared by the navigating officer of Sir Douglas Mawson's ship *Discovery* on the voyages of 1929–31 with a number of notes by Sir Douglas. In August 1938 the Secretary, finding himself in Oslo, took advantage of the opportunity of learning from Captain Hansen many dates, names, and details which were with difficulty disentangled from the published accounts, and made copious notes which have been of the greatest assistance to the draughtsman in compiling the test map. In September a tracing of the compilation was sent to Captain Hansen with a request for criticism, and he very kindly made us a large number of notes which have been used in perfecting the present map (following p. 272). Where the present outline of the coast is due essentially to the work of Mr. Lars Christensen's expeditions in this sector of the Antarctic, we have shown it in red, and in red also the names given by him and his officers to their various discoveries. The names assigned by Sir Douglas Mawson to the same section of the coast are shown in black, and the work of others in green. Details of landings are shown in labels which are attached

Photographs by J. F. Hurley

Landing on island off Cape Bruce, Mac-Robertson Land, during B.A.N.Z. Antarctic Research Expedition, 1929–31

Cape Bruce, Mac-Robertson Land

Scullin Monolith, Mac-Robertson Land

Cape Batterbee from Proclamation Island, Enderby Land

to the localities by a line ending in an arrow. The effective limit within which any particular piece of work is dominant has been indicated by arcs ending in arrows and bearing the name of the leader, the ship, and the date of the expedition. Generally speaking the name and date shown are those of the first effective representation of the coast-line. It has not been possible to indicate later visits or positions of detail unless they are of particular importance. A great number of lands have been named upon these coasts and they have usually no boundaries. The extent over which the given name is written depends naturally upon the nationality of the writer, and earlier names of lands tend to be diminished in extent as coasts upon each side of them are investigated and named. We have been careful to write the names of lands so that the longitude of the beginning and end of the name is that of the map from which it is taken, and when the name is shown in different colours and in different extents that indicates the way in which the name has been adopted on the maps of others, sometimes with a restricted application. Wherever it has seemed necessary these historical notes have been added to elucidate points which might otherwise have been obscure or which could not be shown adequately upon the scale of the map. The recent photographic surveys made by the officers of Mr. Lars Christensen's ship have provided an immense amount of information which is being gradually plotted by arrangement with the Norges Geografiske Opmåling. In due course we shall have very detailed plans of the coast-line and borders of the ice and positions of the coastal mountains, but since there is hardly any ground control it is not possible to place these results accurately upon the map. So far as we know only one astronomical position has been determined ashore, by Sir Douglas Mawson at Scullin Monolith on the mainland.

While the map was being compiled, preliminary reports of three recent expeditions were received. Through the courtesy of the *Discovery* Committee we have obtained the following details of the visit of the R.R.S. *Discovery II* to the coast between long. 0° and 4° E.

The R.R.S. *Discovery II* while steaming southward sighted a corner of the Barrier on 3 March 1939 in lat. 69° 15′ S., long. 0° 10′ E. During the following days, this was followed eastwards on various courses for over 140 miles. She steamed close along the Barrier throughout, and its position was plotted from the ship's track. On March 4, land was definitely seen about 5 miles to the south, but through a mishap to the motor boat no landing was made. The next day the continent was sighted at various intervals; on one occasion the vessel was 3 cables off-shore in 60 fathoms. On March 6, the examination was abandoned on account of the poor visibility and the prevalence of pack-ice. When first encountered, the Barrier was afloat in 1114 fathoms, which suggested that it might be a great ice-island, but subsequent soundings when close alongside averaged 160 fathoms. The first definite view of the continent on March 4 proved that there were no peaks or mountains in the neighbourhood, but that the land rose gently to the south until lost to sight at an elevation of about 2000 feet. Though no outcrops of rocks were seen during the visit, there was much evidence of the presence of land.

This position of the coast-line has therefore been shown on the map in

accordance with the data supplied by the *Discovery II*. It should be emphasized that this is not claimed to be the first survey of the coast in this region.

Mr. Lincoln Ellsworth, accompanied by Sir Hubert Wilkins, has recently returned from an expedition on the *Wyatt Earp* to the Australian Antarctic Territory. On 3 January 1939 a landing was made on the Svenner Islands, in lat. 69° 10′ S. and long. 76° 30′ E., and on January 6 on the Rauer Islands, 25 miles to the east. Three days later, he landed "on a section of the Antarctic barrier and the rocky surfaces that show on its seaward side," in lat. 69° S., long. 77° E. Three reconnaissance flights were made along the barrier by the Aeronca seaplane, and on January 11 Ellsworth flew southwards on the large Northrop plane to lat. 72° S., 79° E., where a flag and a record of the flight were dropped. These details have been taken from the *Polar Times* (No. 8, March 1939), in which Ellsworth's despatches to the *New York Times* were reprinted. The limits within which the expedition was at work have been indicated on the map.

At the beginning of this year, a German expedition on the *Schwabenland* led by Captain Ritscher claims to have surveyed photogrammetrically an area of about 350,000 square kilometres between long. 5° W. and 15° E. No landings appear to have been made on the mainland, and details of the expedition are not at present available.

The following is a chronological list of landings on or near the mainland:

1912 Feb. 21	Wild. Queen Mary Land: ice-shelf, until 22 February 1913.
1929 Dec. 22	Riiser-Larsen and Lützow-Holm. Enderby Land: on skerries, from plane.
1930 Jan. 13	Mawson. Proclamation Id.
1931 Feb. 13 or 14	Klarius Mikkelsen. Thorshavn Bay: two landings on mainland.
1931 Feb. 13	Mawson. Scullin Monolith: mainland.
1931 Feb. 13	Mawson. Murray Monolith: mainland.
1931 Feb. 18	Mawson. Cape Bruce: two landings, one on mainland.
1933 Mar. 5	Riiser-Larsen. Prinsesse Ragnhild Land: ice-shelf.
1935 Feb. 20	Klarius Mikkelsen. Ingrid Christensen Land: mainland.
1936 Feb. 26	Rayner (R.R.S. *William Scoresby*). Scullin Monolith: mainland.
1936 Feb. 27	Rayner (R.R.S. *William Scoresby*). William Scoresby Bay, Bertha Id.
1937 Jan. 30	Lars Christensen. Scullin Monolith.
1939 Jan. 3–11	Lincoln Ellsworth 1938–39 expedition. Jan. 3: Svenner Ids. in long. 76° 30′ E. Jan. 6: Rauer Ids. Jan. 9: Landing on what appeared to be mainland in long. 77° E. Jan. 11: Landing on bay ice in 68° 30′ S., 79° E.

A proof of our map was submitted to the Government of the Commonwealth of Australia, from whom we have received a number of notes upon it. In several instances the map has been amended in accordance with this information; in others, for reasons stated, the suggested amendments have not been made. The more important comments are noted below, the passages in quotation marks being the comments of the Commonwealth Government.

The Commonwealth Government have assigned the following limits in longitude to the "Lands" in the Australian Antarctic Territory: Enderby Land, 45°–55° E.; Kemp Land, 55°–60° E.; Mac-Robertson Land, 60°–73° E.; Princess Elizabeth Land, 73°–86° E.; Kaiser Wilhelm II Land, 86°–91° E.; Queen Mary Land, 91°–102° E.; and Wilkes Land, 102°–136° E.

47° East longitude. "Hvit Island is non-existent." No authority is given for this statement: the island has therefore been shown as mapped by the *Norvegia* expedition in 1930.

47° E. "Mount Christensen should be indicated farther south. It is on the mainland and on the same meridian of longitude." The purpose of the map being to show the original results of exploration, this adjustment, in the absence of further details, has not been made, and Mount Christensen is shown in the approximate position assigned to it by Sir Douglas Mawson on his map published in the *Journal* for August 1932.

60°–67° E. "The latest determinations show the coast-line between the Sheehan Nunatak and the Scullin Monolith to be 5 miles west of the charted position." This coast-line is shown as originally charted by Sir Douglas Mawson.

77° 30′ E. "Sir Douglas Mawson saw the whole of the land from 72° E. to 86° E. at a very great distance, but was unable to fix its latitude. It would not however be to the north of black pecked line and probably farther to the south. The map published by the Society in August 1932 shows a northward inclination of the pecked line (conjectural coast-line) towards a tongue of grounded bergs at 80° E. Owing to the under-estimation of the distance this tongue of grounded bergs was placed at 80° E., whereas examination of a sketch made by Sir Douglas Mawson during his flight on 9 February 1931 shows that they were in fact off King Leopold Coast and that the whole of the pecked line should run on a general line between his Cape Amery and the West Barrier or farther to the south." The coast-line on the published map has therefore been adjusted to this position.

103° E. "Bowman Island is shown in the position indicated on Admiralty Chart 3171 (published 6 January 1933) in 101° 15′ E. This is incorrect; Mawson's position for Bowman Island is between long. 103° E. and 103° 30′ E., and lat. 65° 15′ S. The new island which is approximately in the same position as Bowman Island indicated on Admiralty Chart 3171 has been designated Mill Island." We understand that the position of Bowman Island in long. 101° 15′ E. on Admiralty Chart 3171 was based upon a tracing showing the approximate position of the land seen on one of the flights of the seaplane on Mawson's expedition in 1931. Sir Douglas Mawson's position for the island, as stated above, is between long. 103° E. and 103° 30′ E. It will be remembered that the navigators of the R.R.S. *William Scoresby* when visiting this area in February 1936 were convinced that there were two islands in these approximate positions. It seems probable therefore that the Mawson expedition sighted the two islands at different times. In accordance with the decision of the Commonwealth Government, the name Bowman Island has been applied to the eastern island and Mill Island to the western island on the accompanying map.

The photographs accompanying this note were taken on Sir Douglas Mawson's Antarctic expedition, 1929–31. They supplement those already published with his account of this expedition in the *Geographical Journal* for August 1932. It should be pointed out that in Appendix II following this paper (pp. 124–6) there are errors in the dates. For 1930 read 1929, and for 1931 read 1930 throughout; also on p. 108 read December 31 for December 29, and on p. 126, February 11 for February 8. These appendices were originally sent for information, and not for publication without revision; by an accident however they were published before Sir Douglas Mawson had had an opportunity of checking them.

By an Order in Council of 14 January 1939 the Norwegian Government have claimed sovereignty over that portion of the Antarctic continent "from the boundary of the Falkland Islands Dependencies in the West (the boundary of Coats Land) to the boundary of the Australian Antarctic Territory in the east (long. 45° E.) with the land lying within this coast and the environing sea." No meridian is given as the western limit of the claim, presumably owing to uncertainty about the extent of Coats Land. It will be remembered that by Letters Patent of 28 March 1917 the eastern limit of the Falkland Islands Dependencies was declared to be long. 20° W. This excluded a portion of Coats Land, discovered by W. S. Bruce in the *Scotia*; but later, in negotiations with Norway, the British Government have maintained their sovereignty over the whole of Coats Land. Coats Land was first sighted on the voyage of the *Scotia* during the Scottish National Antarctic Expedition under W. S. Bruce. On 3 March 1904, in 72° 18′ S., 17° 59′ W., a lofty ice barrier, running in a north-easterly and south-westerly direction, was sighted. Subsequently this barrier was traced to a point about 150 miles to the south-west. The expedition were satisfied that they were off a new Antarctic land, to which they gave the name Coats Land. Land was again seen in this neighbourhood by Sir Ernest Shackleton from the *Endurance* on 10 January 1915. The most northerly point was in approximately 72° 34′ S., 16° 40′ W. The *Endurance* then followed the barrier in a south-westerly direction, until beset on January 18.

SAND AND SHINGLE FORMATIONS IN CARDIGAN BAY

J. A. STEERS

THIS paper is concerned only with the present-day coastal forms of that part of Cardigan Bay between Pwllheli and Fairbourne. It does not deal with the story of Cantref y Gwaelod, but a few important references are given to recent literature on that subject. A large amount of detailed mapping was carried out in September 1938 on Morfa Harlech and Morfa Dyffryn and adjacent areas. The absence of shingle in ridge form as it is found for example in East Anglia and the Moray Firth makes it difficult to trace the stages in the evolution of these shore forms. Sand-dunes often give a clue to the development of various features, but the large amounts of sand blown as a layer over big areas obscure structures. The coast-line is treated in units, beginning at Pwllheli. Historical data are extremely scanty, and maps of even rough reliability only go back for about 150 years. No other physiographical descriptions appear to have been written of this piece of coast-line, so that it has not been possible to examine changes and discuss earlier views.[1]

I should like to thank those who have helped me in various ways. The mapping of Morfa Harlech and Morfa Dyffryn was carried out under my direction by Mr. R. H. Hughes and Mr. J. A. Lofthouse; Ro Wen and the Fairbourne marshes were surveyed by Mr. W. G. V. Balchin, who also helped me with transposing detail from the air photographs. Mr. K. R. Sporne gave me much assistance with the botany. Mr. B. B. Thomas, of Coleg Harlech, Dr. H. Dighton Thomas, Dr. H. Godwin, and others mentioned in the paper gave me helpful advice and criticism.

Pwllheli to Pen-ychan

Between Pwllheli and the headland of Pen-ychan there is a remarkably smooth stretch of shore. Near Pwllheli [2] the sandy beach is backed by a narrow line of dunes. To the east these dunes are less regular and wider. About half a mile east of Abererch station the dune-belt is interrupted by an outcrop of boulder clay. Up to this point there is little or no shingle, but eastwards shingle increases in amount, and at Pen-ychan there are three or four high storm ridges. In this eastern part of Morfa Abererch there is also a good development of old, grey dunes now some distance from the sea. The old cliff-line can be traced inside them along the high ground of Pen-ychan and towards Pwllheli. The whole bay shows clearly the eastward movement of both beach material and blown sand, and the headland of Pen-ychan acts as a great groyne. The bay also illustrates the effect of exposure. At its western end there is no direct incidence of waves from the south-west, as this part is protected by Careg yr Imbill, the tied island south of Pwllheli harbour. But near Pen-ychan the coast receives the full force

[1] Exception should be made of W. Ashton's 'The evolution of a coast-line,' 1920. Whilst there is a great deal of information in this book, the author's views on certain general matters are open to criticism.

[2] The artificial alterations made in constructing Pwllheli harbour are omitted. See Lewis Morris, 'Plans and harbours, etc., in St. George's Channel,' 1748, and Act of Parliament 48 Geo. 3, *re* construction of embankments.

of the winds and waves, and the amounts of shingle and sand are arranged in direct proportion to this attack.

Pen-ychan to Criccieth

North of Pen-ychan Point there is an extensive outcrop of the lower boulder

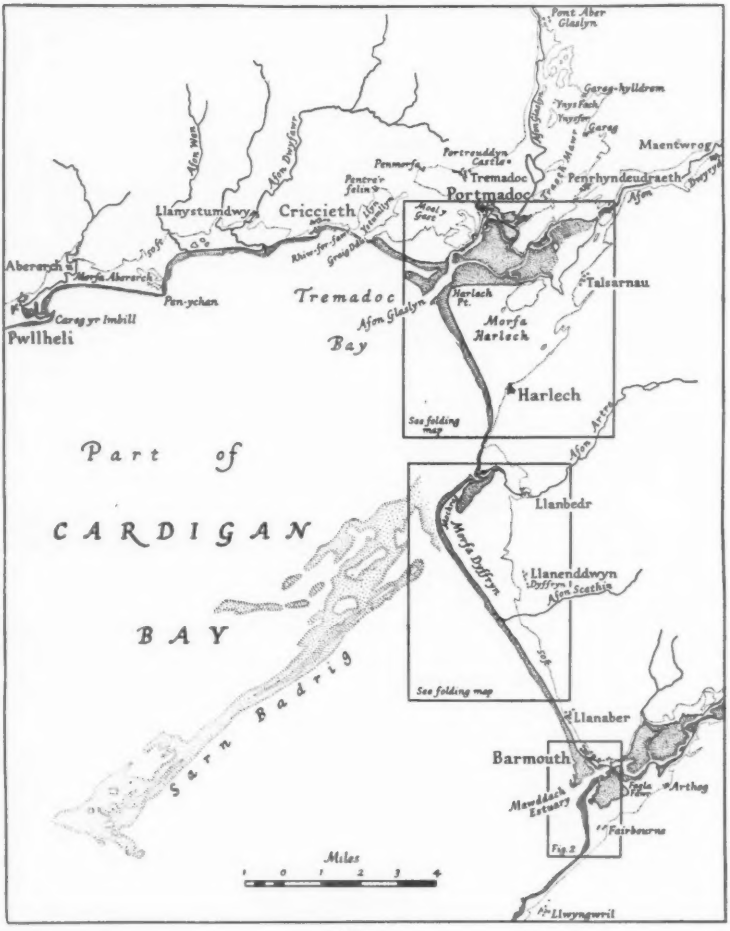


Fig. 1

clay [1] which reaches to the Afon Wen, a small stream which trickles over the beach. The clay is subject to erosion, and the material, except for a certain amount which is held up by extensive sea-walls and groynes near the station,

[1] T. J. Jehu, *Trans. R. Soc. Edinb.*, vol. 47, p. 17. Erosion is serious in the boulder-clay cliffs east and west of Afon Wen.

travels eastwards. The three small lakes marked on the Ordnance map just east of the station lie on a marshy area which before the railway was built was open salt marsh. A culvert allows the sea to flood part of this area during storms. *Phragmites* and *Scirpus lacustris* are common.

The cliffs of boulder clay and glacial gravels with occasional peat-beds east of the station provide abundant shingle, which in its eastward movement has deflected the Afon Dwyfawr for about a mile. This spit more closely resembles the East Anglian diversions than any other on this piece of coast. On the east side of the river is another outcrop of boulder clay which has held the mouth close to its present position for a long time. The deflecting shingle bar is covered with low dune, and north of the river are several older ridges in the marsh between the river and Llanystumdwy. The boulder clay outcrop east of the river's mouth is almost continuous as far as Criccieth castle. Traces of a submerged forest, presumably of the same age as that at Llanaber, are occasionally to be seen about a quarter of a mile east of the Dwyfawr mouth. Criccieth cliffs are subject to considerable erosion,[1] and the Borough Surveyor (Mr. W. Williams) has found that the best protection is obtained by building groynes outwards from them so that they make an angle of about 85° with the coast to the west.

Criccieth to Graig Ddu

The boundary between this and the section of the coast to the west is made by the outcrop of igneous rock on which stands Criccieth castle.[2] Eastwards of the castle is a wide beach at the back of which part of the town is built. Then follow some lower boulder-clay cliffs which provide material for shingle beaches. Approximately three-quarters of a mile east of the station there begins a typical shingle embankment which runs as far as Graig Ddu. At Rhiw-for-fawr the railway cuts through solid rock, and an old but small cave can be seen on the landward side. Eastwards of this the shingle dams Llyn Ystumllyn, a former arm of the sea. When the embankment formed is not known; the fact that Saxton and Speed show open water is certainly not conclusive evidence that the change has taken place since the sixteenth century. The stream now draining the lake is diverted eastwards artificially and empties into the sea at Graig Ddu.[3] Part of its lower course is enclosed. Mr. Owen, of Croesor, thinks the lake was drained to its present state about 1840, but no definite record is obtainable. The former mouth, probably a percolation through the shingle, was near Rhiw-for-fawr, and the change to the present outlet appears to have been made between *c.* 1763 and *c.* 1785.

Near Graig Ddu the shingle increases both in amount and in the size of the pebbles. On a smaller scale it resembles the eastern end of the shingle alongside Morfa Abererch. Some older ridges are inside the present storm beach near the railway halt. Recent storms have breached the outer shingle in several places, and spread out fans.[4]

[1] See W. Ashton, *loc. cit.*, p. 236.

[2] The first certain reference to this castle occurs in 1239. 'Provisional guide to Criccieth castle.' H.M. Office of Works, 1934.

[3] There is much artificial drainage in the basin of the lake.

[4] On 23 November 1938 the shingle was severely breached, and the railway bridge, under construction, much damaged. (See *The Times*, 24 November 1938.) W. Ashton,

Llyn Ystumllyn is now a freshwater marsh, grading in places to a shallow lake. In storms some sea-water may find its way over the bar, but appears to have only a small effect. The dominant plants are *Scirpus lacustris* and *Phragmites communis*, with a good deal of *Salix cinerea* along the eastern side. In September 1938 the *Salix* was often under about 2 feet of water. Large areas of open water, almost without vegetation, still remain. The bog bean, *Menyanthes trifoliata*, dominates several isolated areas.

This gulf formerly ran up to the main road near Pentre'r-felin and at that time only a narrow isthmus joined the Moel y Gest peninsula to the mainland.

Graig Ddu to Portmadoc

Graig Ddu consists of Cambrian rocks with minor intrusions of dolerite and contains several caves. The beach to the east is hard and sandy,[1] and between it and the high ground is a dune system now called Morfa-bychan. The general shallowing of Tremadoc Bay, discussed below, caused extensive sand-flats to form, and the prevailing winds blowing over them have built dunes in the former irregular bay. Ynys Cyngar is a rocky headland which has been tied to the mainland by sand-bars. The Glaslyn channel south of Portmadoc is, and has been, subject to considerable changes, and is difficult to navigate. At present it cuts into that part of Morfa-bychan between Ynys Cyngar and Gareg Goch. The remainder of the coast up to Portmadoc harbour [2] is rocky, with small sandy bays. Little need be said about it, except that the vagaries of the Glaslyn channel are apt to cause local changes. The Ordnance Survey maps do not show the present position of the channel.

Portmadoc and the Glaslyn valley

Before the enclosure and the embankment built by W. A. Madocks in 1811 the tide reached nearly to Aber Glaslyn bridge, and the whole of the Glaslyn valley resembled the Mawddach and Dovey estuaries. The idea of enclosing the Glaslyn valley arose as early as 1625 when Sir John Wynn of Gwydir wrote to Sir Hugh Myddleton on the matter. It will not be necessary to discuss the various schemes put forward from time to time, but it should be emphasized that many minor embankments were built before 1800. These enclosed areas of 50–1000 acres and were made of soil, sand, and turf. In places trees were planted. The details of these smaller embankments, as well as that of the bigger scheme of Madocks, have been described in an unpublished thesis by W. M. Richards, now of Portmadoc, entitled 'Dissertation on the history of Traeth Mawr and the industrial results of the formation of the embankment' (1925).[3] The enclosure-map appertaining to Madocks's scheme

loc. cit., p. 237, says the embankment was artificially built about two hundred years ago. I do not know what evidence there is for this statement. The shingle appears to be natural, but may be piled on an old wall. There is every reason to expect that a natural bank would form here.

[1] The Borough Surveyor of Criccieth told me that just east of Graig Ddu shingle can be found at 6 or 7 feet below the sand. So far as is known this is very local.

[2] At H.W.O.S.T. the rise of the tide at Portmadoc Quay is 12½–13½ feet; at neaps, 7–8 feet. The tides flow for about 4½ hours at the quay, and ebb about 8 hours at springs and neaps in normal weather.

[3] Mr. Richards kindly lent me a copy of his thesis, to which I am much indebted for various details; a copy is kept in the Library of the University College of Wales, Cardiff.

Fairbourne, Ro Wen, the marshes, and Mawddach estuary

Morfa Harlech, with the Snowdon mountains

Talsarnau marshes: small creek and inner drainage channel

Talsarnau marshes: sward, large creek, and undercutting

Llyn Ystymllyn

Aber Glaslyn valley and Snowdon

is kept at the County Offices at Caernarvon. It is dated 1825, and makes clear that considerable areas between Portreuddyn castle and Tremadoc had been enclosed before 1800. The Penmorfa area (1900–2000 acres) was reclaimed by W. E. Oakeley, of Tan y bwlch, between 1798 and 1800. On the eastern side of the Glaslyn valley a large area from Gareg to Gareg-hylldrem, and including Ynysfor and Ynys Fach, was enclosed soon after 1770. It is also probable that much minor embanking had been completed by farmers and landowners at a still earlier date, but records of this cannot now be found. Certainly no serious attempts were made before 1770.

The Act for the Enclosure of Traeth Mawr was passed in 1807 (47 Geo. 3, sess. 2, cap. 36, August 1807). The embankment ran from Penrhyn-isaf to Ynys-Towyn, and was engineered and designed by Thomas Payne, of Fenny Compton. It was foreseen that the pent-up waters of the river would give great difficulties in building the bank, and so the river was diverted westwards to its present course, and a bridge and flood-gates built. The bank was finished in September 1811, but in February 1812 was breached by a gale. This breach, about 100 yards wide, was closed by the end of 1814. A glance at the map will show how the wall altered the appearance of the coast. The former island-studded estuary of sand-banks and shallow water has been converted into an area of flat land used for various agricultural purposes. It has added a large area of land to Caernarvonshire, but cannot be said to have increased its natural beauty.

The building of the towns of Tremadoc and Portmadoc followed the enclosures at Penmorfa and the Portmadoc embankment. The harbour at Portmadoc was also built, chiefly as a convenient place from which to export slates from Blaenau Ffestiniog which had previously been brought down by pack-horse and waggons to the Traeth Bach. Quays for this purpose existed at Tyddyn Isaf, Cemlyn, Gelli Grin, Pentrwyn Garnedd, and Cei Newydd, all on the river Dwyryd. Thence the slates were taken in barges to Ynys Cyngar to be loaded on to larger ships. Madocks obtained (August 1807) authority to build a pier and quay at Ynys Cyngar, but as a result of the Traeth Mawr bank the rivers Glaslyn and Dwyryd cut a deep channel from near the present Ballast Island to Ynys Cyngar. This led to the building by Madocks of a new harbour, *i.e.* Portmadoc, in 1821 (Act 1 & 2 Geo. 4, cap. 115). Hence the Traeth Bach quays were doomed, but not finally until a tramway had been built along the embankment from the quarries. The Act for the so-called "Slate" railway was obtained in 1832.

Portmadoc was, and is, a difficult harbour, and can only be used by small ships. The water is shallow, and the channels liable to big changes. After 1906 the Dwyryd took a separate course to the sea, and so the combined estuary of the Glaslyn and Dwyryd is drained by two channels.

The Dwyryd estuary and Talsarnau

The Penrhyndeudraeth peninsula separates Traeth Mawr from Traeth Bach. Its coast is picturesque and rocky, with small sandy bays. The Dwyryd reaches the sea through a narrow glacial gorge, whose natural beauty is spoiled by the road and railway bridge. Above the gorge the valley widens out, and was formerly tidal as far as Maentwrog. The river has been

embanked, and much of the estuary reclaimed. A certain amount of open marsh still exists in its lower parts. Small ships were built in this estuary in quite recent times, *e.g. The Ocean Monarch* at Pentrwyn Garnedd in 1851. Lower down, at Abergafran, several ships were built between 1834 and 1858.

South of the bridge (Pont Briwfad) there is an extensive series of marshes. The village of Talsarnau [1] on the main Harlech–Maentwrog road almost certainly "obtained its name from the junction of several trackways at a point where stands the small hostel called 'The Ship Aground,' whence a lane leads to the place of crossing of the Traeth Bach." [2] This trackway was only available at low water, and led north of Ynys Gifftan to the by-road, still marked on the current edition of the 1-inch Ordnance Survey, immediately south of the "n" in Minfordd.

Talsarnau marshes

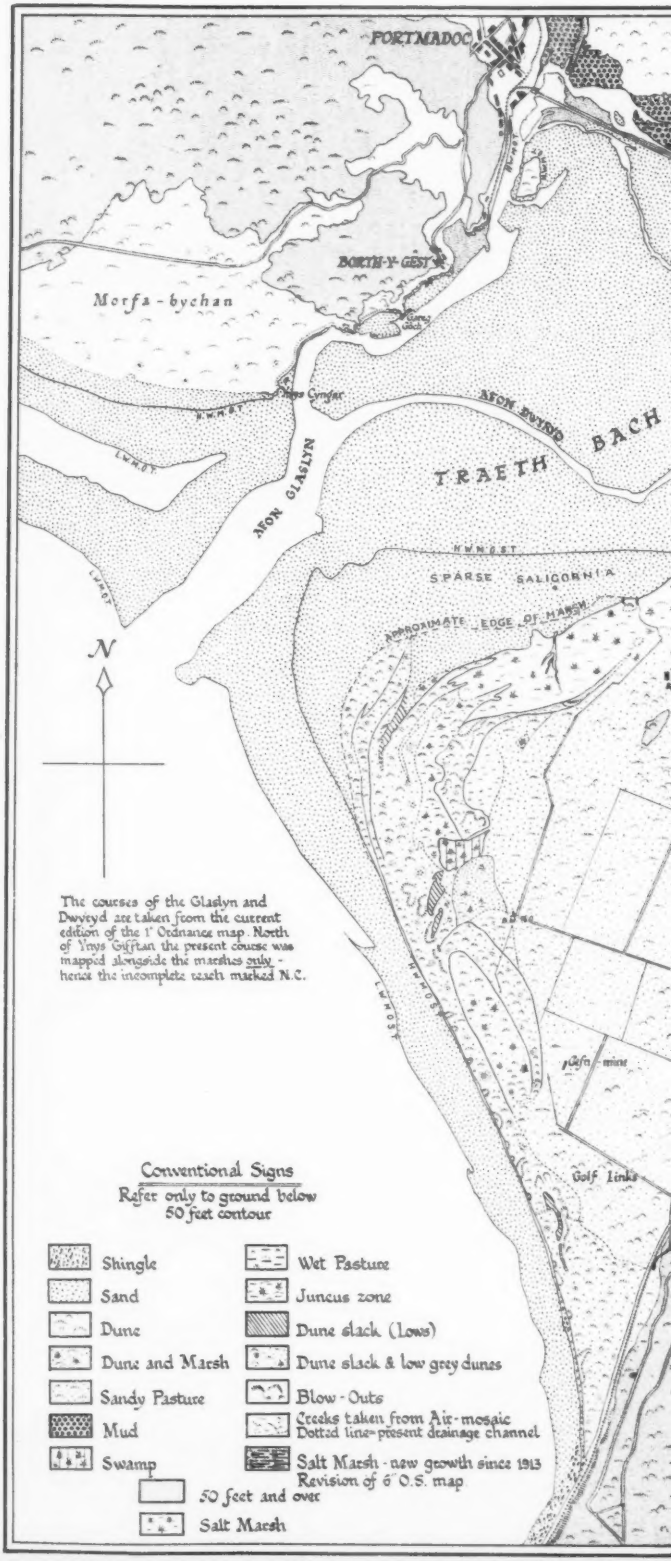
The foreshore from Pont Briwfad to the sea-wall running from Llanfihangel-y-traethau to the main road at Glan-y-wern is a unit. Before the reclamation the tides flowed almost to the main road, but the sea-wall now runs west of the railway. The reclaimed marshes are either cultivated or grazing land.

At Talsarnau the whole marsh is really a sward with a narrow *Juncus* belt near the sea-wall. The sward is of the higher type, *i.e.* it consists mainly of *Festuca*, *Agrostis*, and *Glaux*. *Plantago coronopus* is found at the highest levels replacing *Glaux* to some extent. There is not much sward belonging to the lower levels,[3] but there has been recent rapid growth of the marsh which now reaches Ynys Gifftan. In this part the level is slightly lower, and the sward is largely of the lower type, *i.e.* with *Glyceria* dominant. All the sward is grazed by sheep, and, apart from creeks and pans, presents a close-cut lawn-like appearance. Turf is often removed. There is virtually no mud, and the upper 6 inches or so form a soil intertwined with grass roots and of finer texture than the sand below. This is well seen along any creek, but more particularly in the northern part where a meander of the Dwyryd is cutting into the marsh. The underlying sand is washed out, and the more coherent soil-layer falls down in blocks. Along the main stream the fallen blocks almost have the appearance, at a distance, of an artificial revetting of the bank. The true marsh creeks are unlike those in Norfolk. This is partly due to the different vegetation, especially the absence of *Obione*, but also to the absence of mud and fine silt. In a creek of any size the banks are undercut, and the soil layer falls down in roughly rectangular blocks. At the bottom of the creek there is nearly always a narrow and shallow drainage trench, which is usually clear of obstructions in the larger creeks. The ease with which the upper coherent layer is undercut leads to natural dams forming in the creeks far more easily than is the case in Norfolk. The result is that the smaller creeks are seldom continuous, but interrupted by blocks of sward. Only the higher tides rise over these dams. As time goes on these dams increase, and the original creeks are converted into a line of separate holes or pans lying in a slight depression of the marsh surface. The effect is rather like that described

[1] *Sarn* means a causeway.

[2] *Inventory of Ancient Monuments, Merionethshire*, No. 519, p. 163.

[3] See *J. Ecol.*, vol. 5, 1917, where Professor Yapp describes the Dovey marshes.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AFON DWYRD BACH
TRAETH
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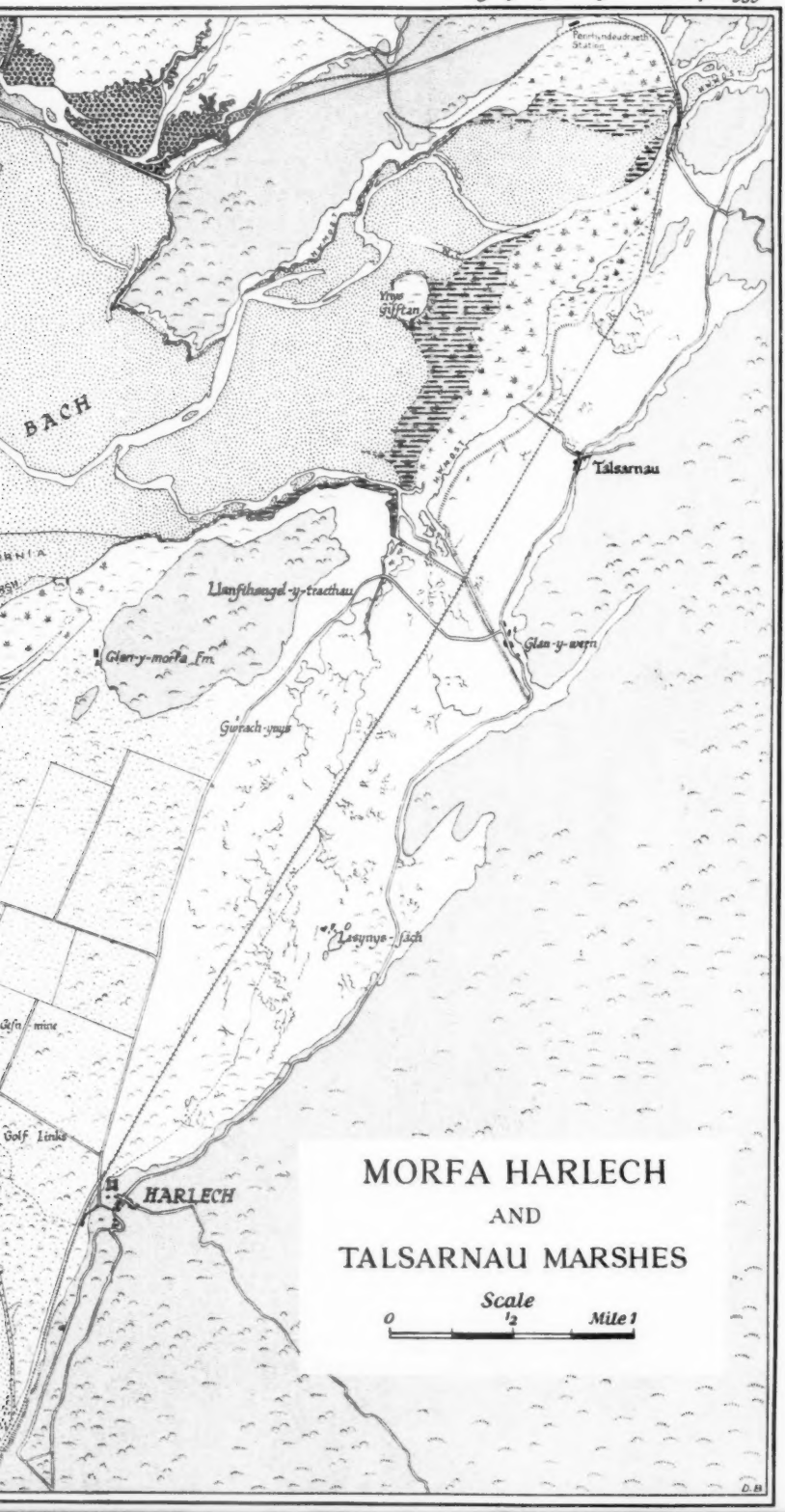
L.W.M.S.T.
S.PARSE SALICORNIA
APPROXIMATE EDGE OF MARSH
N
The courses of the Glaslyn and Dwyryd are taken from the current edition of the 1" Ordnance map. North of Ynys Gifftan the present course was mapped alongside the marshes only - hence the incomplete reach marked N.C.
Golf Links
Conventional Signs
Refer only to ground below 50 feet contour
Shingle
Sand
Dune
Dune and Marsh
Sandy Pasture
Mud
Swamp
50 feet and over
Salt Marsh
Wet Pasture
Juncus zone
Dune slack (Lows)
Dune slack & low grey dunes
Blow-Outs
Creeks taken from Air-mosaic
Dotted line=present drainage channel
Salt Marsh - new growth since 1913
Revision of 6" O.S. map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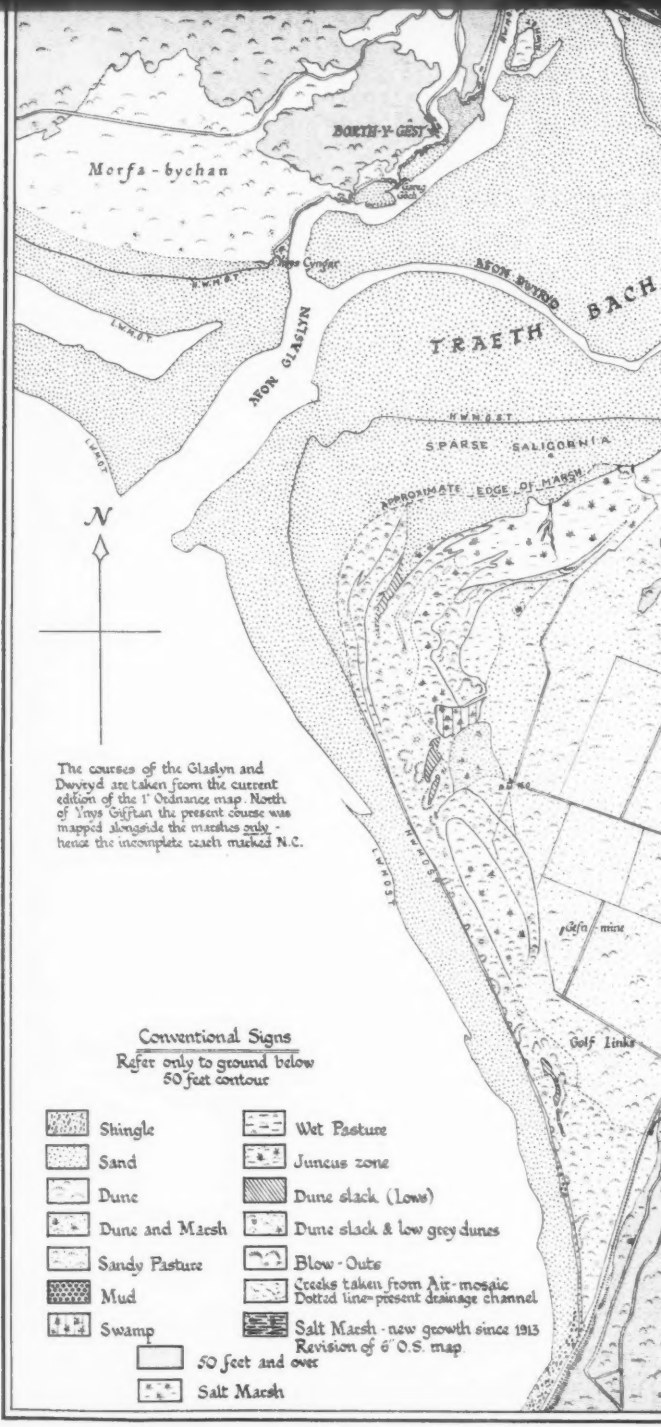

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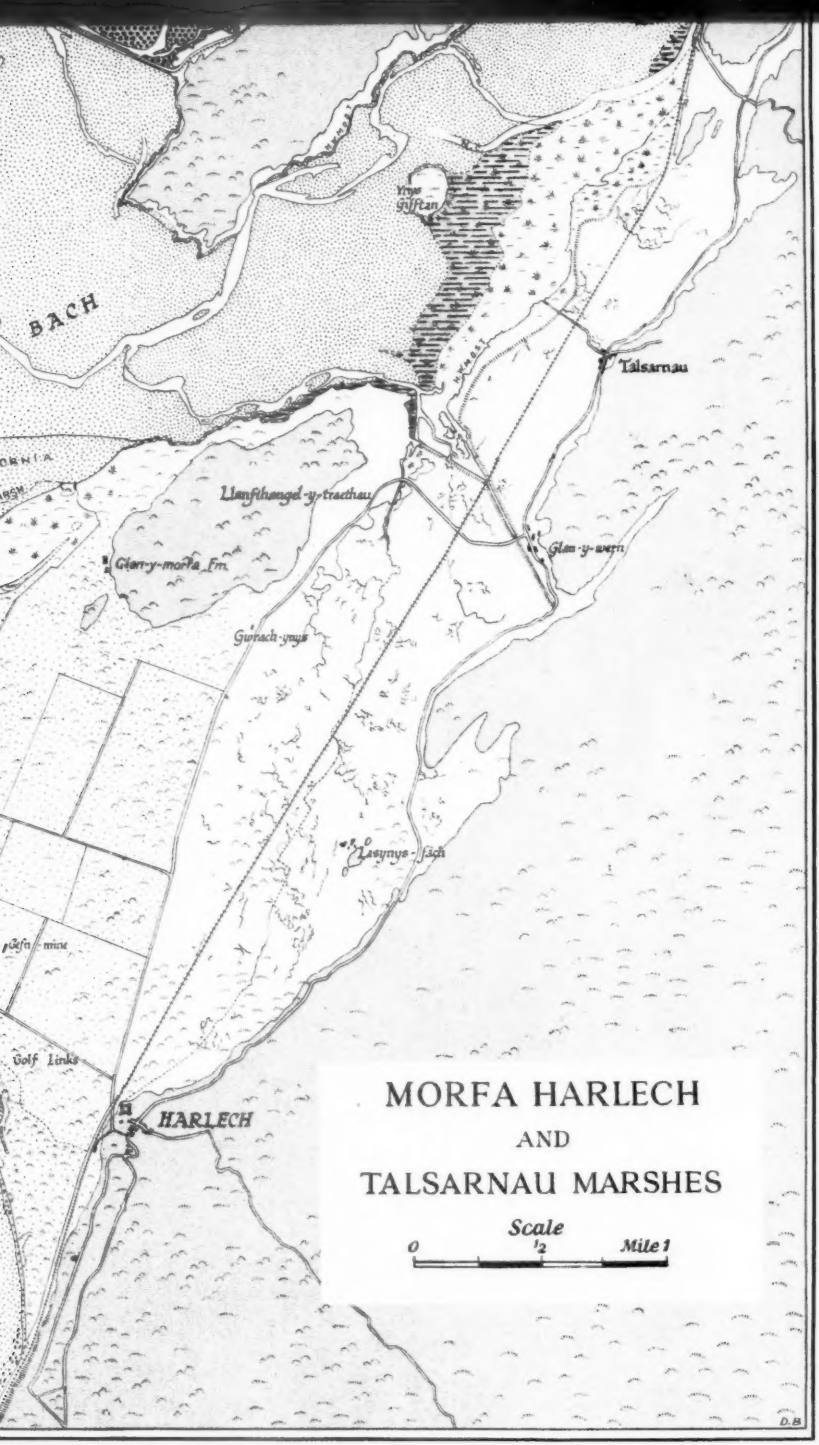

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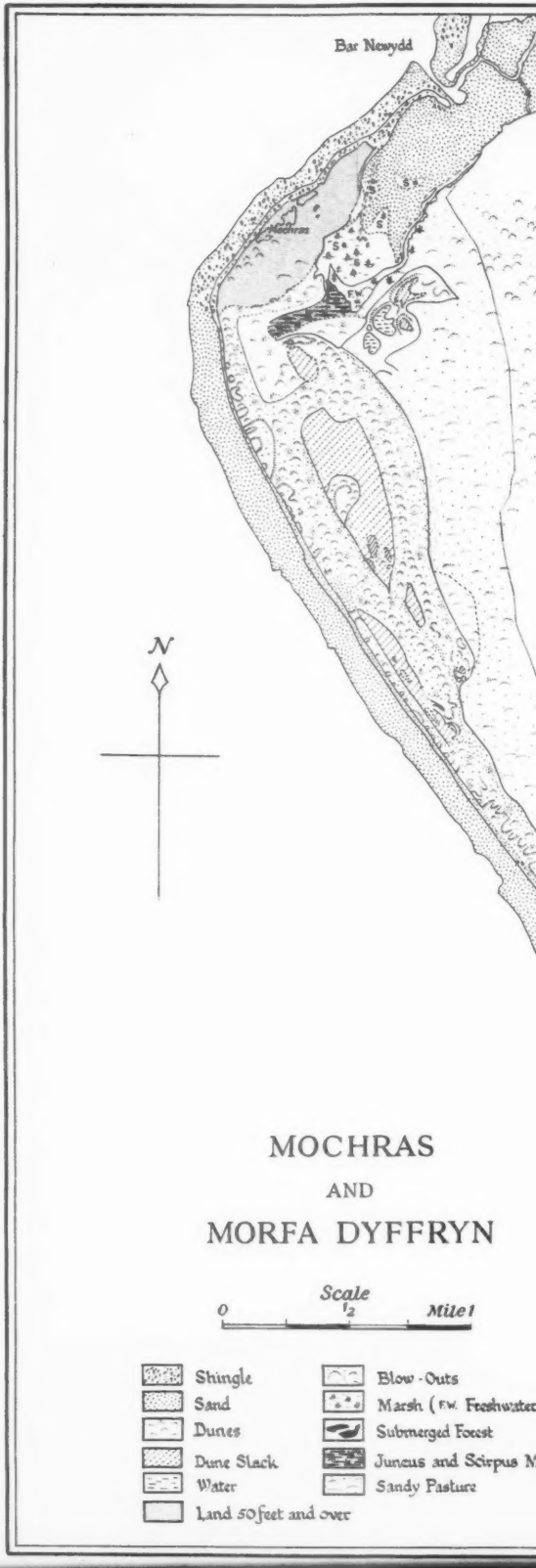
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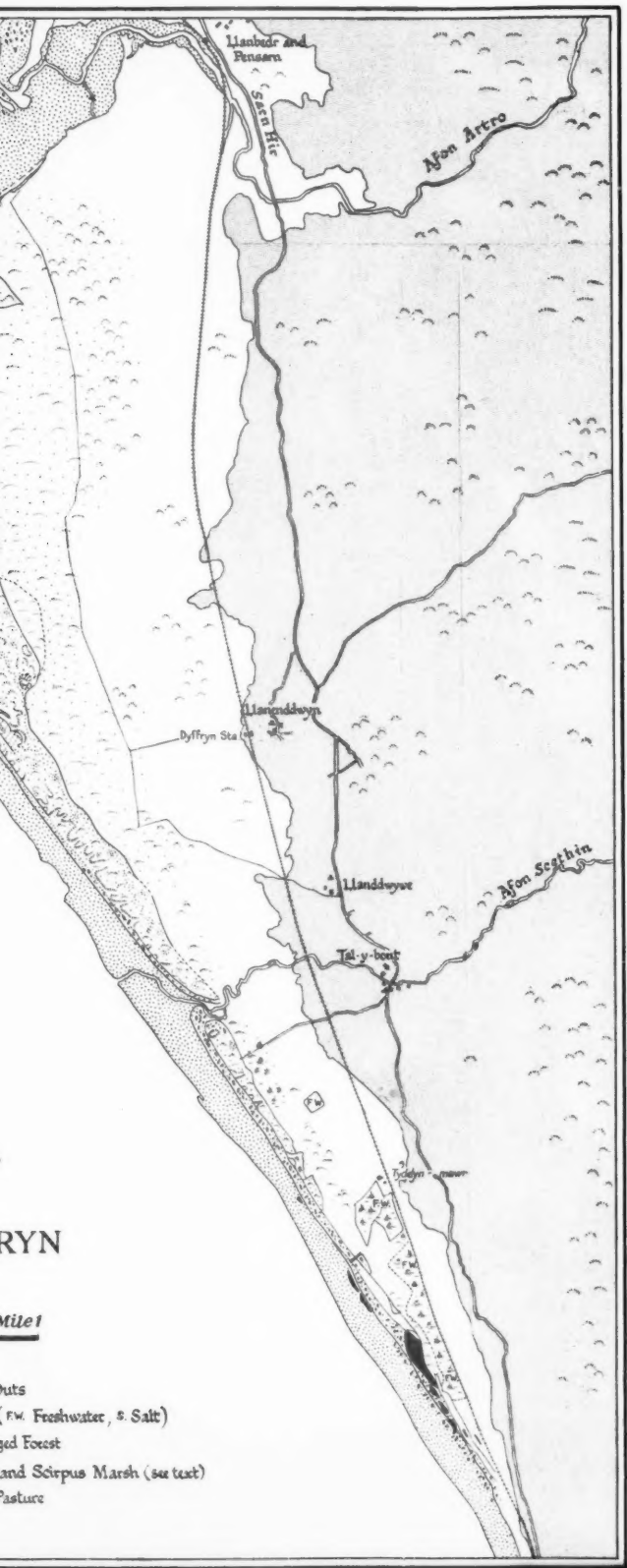
Juncus and Scirpus M
Sandy Pasture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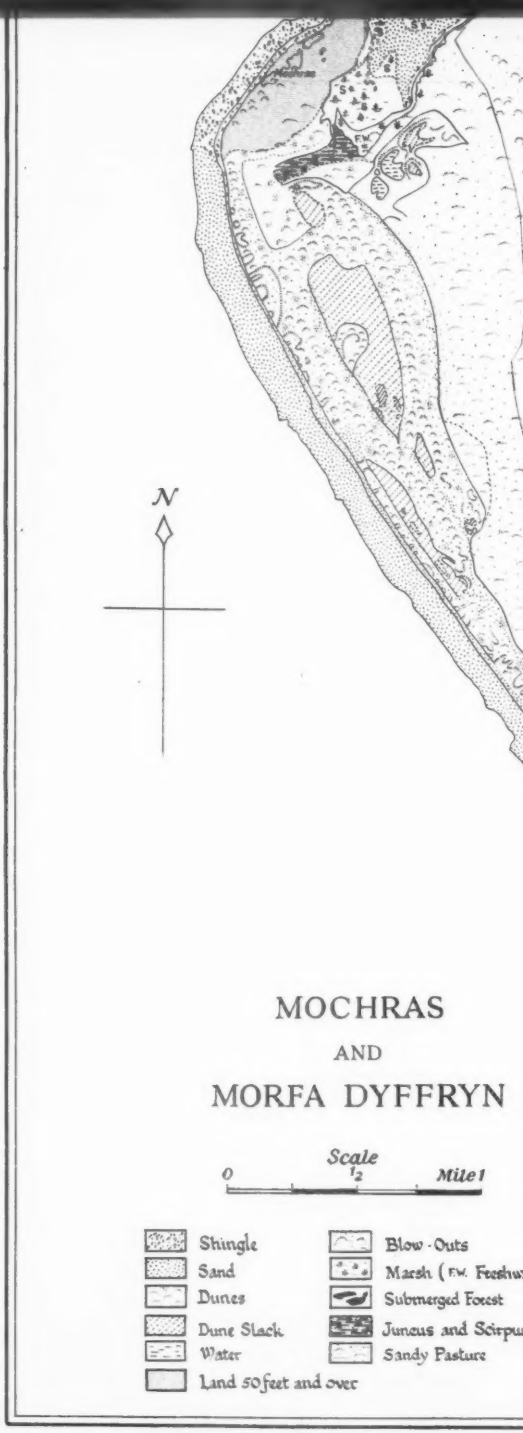
Pasture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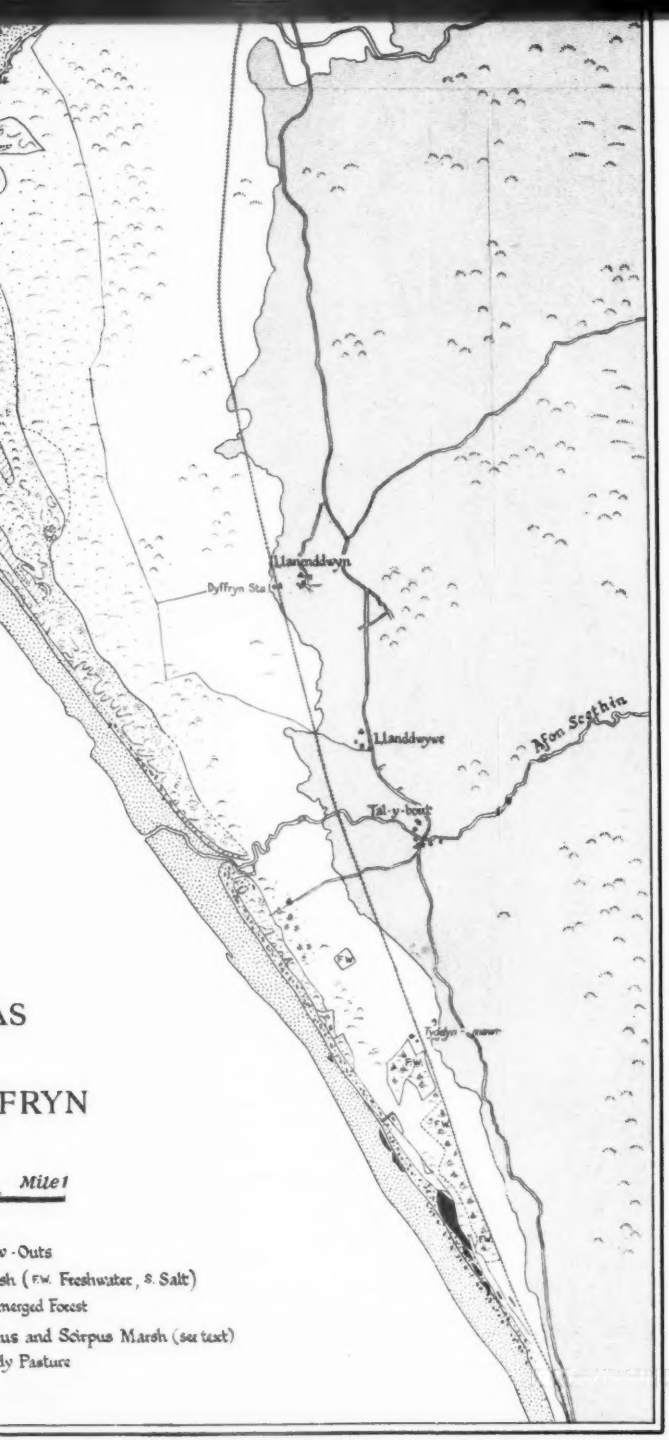
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us and Scirpus Marsh (see text)
dy Pasture

by Yapp in the Dovey marshes, but the still smaller amount of silt at Talsarnau is an important differentiating factor. The round or oval pans are normal, but shallow and often plant-covered, especially where the drainage is good. They are primary pans. The sward is only covered by spring tides.

South of Penrhyndeudraeth station there is a similar area, but *Juncus* is more abundant. Changes in the relative rate of growth of these two areas are likely to be influenced by the swings of the Dwyryd west of Briwfad bridge. The narrow marsh fringe north of Llanfihangel-y-traethau is at present rapidly extending northwards. Here other plants are more common, especially *Armeria*, *Aster*, and *Limonium humile*.

Morfa Harlech

Morfa Harlech and Morfa Dyffryn form the two most prominent coastal features of the northern part of Cardigan Bay. Morfa Harlech is a broad, triangular, sandy foreland largely devoid of any clear structural features. Before discussing its probable origin, it will be well to give a general description of it. As it has been built from Harlech northwards, the description follows as nearly as possible in that order.

The spit begins at the railway embankment, and gradually extends away from the old coast-line, which is marked by a line of high cliffs inside it. In the first half a mile or so it is simply a dune area bordered by a belt of coarse cobble stones. This shingle has extended northwards about 450 yards since the 6-inch survey of 1901.[1] It is the only visible shingle in the whole area. It may be pointed out here that the name Cefn-mine, probably a corruption of Cefn maene (=at the back of the stones), indicates a pebbly area under the marsh near that farm. Mr. Morris, of Gwrach-ynys, remembers seeing stones near the marsh road bridge over the stream which flows eastwards from near Cefn-mine. They could not be found in 1938. Their significance is problematical: they may represent all that is left of an isolated outcrop of boulder clay comparable with the small boulder-clay outcrop in Pwllheli Bay.[2]

As no other surface shingle exists on Morfa Harlech, one cannot trace its growth in a way similar to that adopted for the Culbin Sands or Scolt Head Island. The foreshore is bordered by normal but wind-eroded dunes. Numerous blow-outs are found north of Cefn-mine, and between it and the shore are two lines of dunes separated by a slack which is wet in places.[3] The inner dunes are encroaching on the pasture land within. The rate of movement since 1901 at the fastest place can be roughly estimated at 12 feet a year. On the ground they resemble a parabolic dune, but this term, if it applies at

[1] Figures such as these (also for Morfa Dyffryn) are very rough. It is not clear where the Ordnance Survey would take the outer edge of sand or shingle, nor is it certain whether in a revision of the map such points would be considered. Hence these figures must be treated with caution.

[2] On the other hand it is more than probable that, before the railway embankment was built to protect the boulder-clay cliffs south of Harlech, a great deal of shingle was carried northwards. If so, this shingle now underlies Morfa Harlech; it is certainly not visible on the surface.

[3] All low-lying areas are, of course, much wetter in winter and, though on a smaller scale, rather resemble the winter lochs in the Culbin Sands (*Geogr. J.* 90 (1937) 498–528).

all, only pertains to the north-eastern corner. At this point, near bench mark 16·0 on the map, the blown sand spreads outwards as a flat area, and overlies formerly swampy ground. West of this are two well-marked lows with characteristic vegetation in which the dominant plant is *Equisetum variegatum* in the one and *Hydrocotile vulgaris* in the other.

There is also a freshwater swamp in a deeper hollow that contains water at all times of the year.[1] The level of the water varies much with the season. Its vegetation is interesting, the most abundant plants being *Sparganium ramosum*, *Scirpus lacustris*, *Potentilla Comarum*, and *Menyanthes trifoliata*.

North of this swamp the dunes decrease in height and fan out, but less clearly than if they rested on shingle ridges. The innermost and longest line has partly accumulated along an old wall. The southern part of this line consists of old grey dunes with an abundant growth of *Rosa spinosissima*. Low and wet areas, with hummocks of blown sand, separate this and the other dune-lines from one another. The next line is formed of low grey dunes, and the outermost lines of low shifting fore-dunes. It is clear that we have here a case of a normal prograding shore, whose various stages of evolution are not clearly marked owing to the fact that the sand, often blown with violence, has not kept to definite lines. The outer dune-line can be traced for about a mile to the south, and forms a clear and new belt outside the older and higher fore-dunes.

The outermost zone of embryo dunes is interesting. Two factors at least play a part in its formation, but it is by no means clear precisely how they work. Along the whole foreshore of Morfa Harlech, but particularly at its north-western end, large amounts of seaweed are swept up on to the beach and left as hummocks. These become sand-covered, and appear to start dune formation. But examination of many slightly older dunes lying close to, or actually in, this belt did not show any traces of seaweed. This may be partly explained by the fact that the seaweed soon dries and is blown away, while the sand which gathered in its rear may remain. This is not an entirely satisfactory explanation, but the connection between seaweed heaps and sand accumulation is so clear at first sight that it must often be a cause of the development of embryo dunes. Another factor is that on the wide, sandy foreshore, outside any defined dune-belt, *Glyceria* takes root, gathers sand round it, and so begins to form a dune. The more exposed of these hummocks are often washed away, but this process is an important one. The vegetation of the older Harlech dunes need not be described in detail. At the northern end of the area *Agropyrum* is usually the pioneer, and there is abundant *Euphorbia paralias* on the young fore-dunes. The marram grass (*Psamma arenaria*) is, as elsewhere in the British Isles, the dominant plant of all the dune systems. On the older dunes *Rosa spinosissima* often covers large areas almost exclusively. *Erodium cicutarium*, also common, usually comes in rather earlier.

The curving round to the north-east of the dune-lines resembles similar formations elsewhere. It is partly controlled by the fact that the northward growth of Morfa Harlech is now largely restricted by the swings of the river

[1] Ordinary lows may be enlarged blow-outs: the swamp seems to rest in an original hollow.

channel. A comparison of the few reliable maps[1] covering the last hundred years shows that the north-westward growth of Harlech Point has been some 220 yards. I do not think it likely that the spit will grow much farther in that direction.

Eastwards of the recurved dune-ends, and between them and Llanfihangel-y-traethau, is a good development of marsh. The pioneer plants on the bare sand are *Glyceria* and *Salicornia* spp. *Aster tripolium* follows, and is succeeded by a belt consisting chiefly of *Spergularia marginata*, two varieties of *Suaeda maritima*, and *Plantago maritima*. *Glaux* is abundant near the upper limits of the *Salicornia*. These three zones form the lower level. The upper part of the marsh consists mainly of a sward formed of the grasses *Festuca rubra*, *Agrostis alba*, and *Glyceria maritima*. *Juncus maritimus* is abundant at the highest levels. *Glaux* is ubiquitous except at the lowest level of both zones. Changes in the channel of the Dwyryd have caused local erosion of the marsh near Glan y Morfa farm.

Within the whole dune-belt the rest of Morfa Harlech is a flat plain formed of sand.[2] West of the marsh road from Harlech to Llanfihangel there is a great deal of recently blown sand, and the area may approximately be described as sandy pasture. East of the road the soil is better, and is used mainly for grazing, but also for crops. Some of the lower areas are still wet and marshy. For reasons that are discussed below we may assume that Morfa Harlech has grown from the south. The available evidence and comparison with what is known to be taking place to-day suggest that Tremadoc Bay was continually shallowed by material carried into it by the marine processes sweeping sand and other fine material into this part of the coast.[3] Outside the high-water mark of Morfa Harlech to-day sand is gathering on the flats. This dries and is carried inwards by the wind and forms dunes or hillocks around any suitable obstacle. It may be a long time before such hillocks unite to make a dune belt, but sooner or later this occurs. An examination of maps covering the last century shows that whereas there has generally been seaward growth, there have also been times of retrograde movement. In the past, when the Morfa was less well developed than now, such vicissitudes were probably more frequent. Eventually the Morfa extended so as to include the former island of Llanfihangel-y-traethau.

The Act for the embanking of Morfa Harlech was passed in 1806, and soon after a sea-wall was built from the north-eastern corner of the high ground at Llanfihangel to Glyn Cywarch on the main road. A similar wall enclosed Talsarnau marshes. Before that time the tides flowed some way up

[1] The maps used were: Original 2-inch to the mile O.S. drawing of 1819, the 1-inch O.S., 1838, and the current edition of the 1-inch maps. Earlier maps and charts are not sufficiently reliable to base measurements on.

[2] The numerous drainage channels (artificial and natural) cut in the Morfa all show its sandy nature. No bores have been put down to establish the depth of this sand, but it is probably considerable, especially in the northern part.

[3] Professor W. G. Fearnsides tells me that analyses of the deposits do not suggest that they come from the rivers. On the other hand it is possible that some of the deep material underlying the surface originated in this way. The surface material is wind- and sea-borne from the open coast and offshore zone. The rivers do not bring any appreciable amount of material to the foreshore to-day.

inside the dune belt of Morfa Harlech towards Harlech castle. Unfortunately no record is known to exist which describes the condition of the Morfa at that time. Ordinary spring tides reach to within about 4 feet of the top of the wall; occasional storm tides may just overlap it. Apart from patches of blown sand and numerous field enclosures formed by sand and turf walls, the whole area is almost flat, and even now, if the wall were taken away, abnormal tides would reach far in towards Harlech.

Much may be learned from a study of air photographs of the area. I am indebted to the Air Ministry for obtaining for me a complete set covering Morfa Harlech. These have been carefully examined for past changes. The area west of the marsh road is sand covered, and does not reveal any detail. But between the marsh road and the main road there are numerous traces of former marsh creeks which are invisible on the ground. These creeks [1] were traced from the mosaic, which was on a scale of 1/8160, and then transferred by pantagraph to the map (facing p. 214). It will be seen that they conform to the usual intricate pattern of marsh creeks. The present channel, taking the spring water from Harlech castle, is inserted. In parts it is obviously canalized, but in others its course appears to be natural. Allowing for the fact that the whole area is now pasture or arable, and that in places a good deal of blown sand rests on it, it is reasonable to infer that the creek system originally drained towards the one main creek into which the water from Harlech castle now runs. The map shows that although there are exceptions there is nevertheless a general "grain" in this direction. It would be unwise to press this point too far, but together with other arguments and evidence outlined below it supports the hypothesis of a northward growth of the foreland, and bears directly on the view that the former port or harbour of Harlech was situated within a northward-growing sand-spit. There seems therefore to be a strong case for supposing that as the spit grew from south to north-north-west it enclosed a slightly lower area which, up till the time of the final embanking in 1808, was largely open marsh and intersected by creeks. It is almost certain—records do not exist—that small enclosures had been made, but these do not invalidate the argument here outlined.

We must now turn to the problem of Harlech castle, which was built by Edward I in 1286.[2] It is generally assumed that, as it possesses a water-gate and stands in a position similar to Criccieth castle, it had formerly easy connection with the sea. Although a careful search has been made, it has proved impossible to find any early document which clearly states the condition of the coast-line when the castle was built. Many records exist about the castle, and some of the more important are printed in various volumes [3] of *Archaeologia Cambrensis*. In vol. 1 of the first series reference is made to a manuscript dated 23 September 1564, which in two places refers to the castle as being near the sea and having havens, creeks, and landing-places on either

[1] It would have been possible to insert more creeks on this map, as others are faintly visible on the mosaic.

[2] This is the date at which the castle, as a masonry stronghold, was begun. A ditch was cut in 1285, and the records may be interpreted as implying that a pre-Edwardian castle existed. See the official (H.M. Office of Works) guide to the castle.

[3] Apart from vol. 1, see especially vol. 3, 1848; vol. 4, 1858; vol. 13, 1867; vol. 6, 1875; vol. 13, 1913. See also *Trans. Hon. Soc. Cymmrodorion*, sess. 1921–22, p. 63.

side of it. Historians generally conclude that the castle was built in such a position that it could be reached from the sea, so as to render victualling and garrisoning easier. Mr. C. L. Wayper, at my request, kindly made a careful search in the Record Office; although he was unable to find any complete account of former conditions, I should like to place on record one or two references which, so far as I know, have not appeared in print before:

Public Record Office, C.54. 141. Membrane 5. 15 April 1325. Beaulieu, "To the bailiffs and community of the port of Hardelowe (Harlech)—to cause proclamation to be made forbidding anyone inflicting damage, wrong or annoyance by land or sea upon the men of Flanders, merchants and others, and that the bailiffs shall answer that all men treat favourably the said men coming into the realm with their goods and merchandise by that port."

On 12 December 1325 (C.54. 141. Membrane 16) is another reference to Harlech as a port, and on 10 May 1324 (C.54. 141. Membrane 11) is an order given at Westminster to the effect that all ships carrying 40 tuns of wine are to be prepared and found without delay so that they be ready to set out on the King's service on three days' summons. This is addressed to Sandwich and other ports including Hardelowe.

In C.54. 145. Membrane 22, 28 June 1328, is an order, given at Evesham, to Southampton and other ports, that owners and masters prepare all ships of upwards of 40 tuns to be ready to defend the ports against malefactors from France; Hardelowe is again included. In (Record Office) Accounts E.101. 16/40, Hardelowe is referred to as a port, and in Exchequer Accounts E.101. 19/13, 9 to 12 Edward 3, are particulars of the report of Nicholas de Acton, who was appointed to guard the coast of North Wales and to arrest ships. It is a document concerning the arrest of vessels "de portubus Carnarv. et Hard."

The following quotation from the official guide to the castle by Sir Charles Peers and W. J. Hemp may be given as summing up the opinion so far generally held: "The purpose of the way from the marsh was undoubtedly to secure direct and safe access to the harbour or landing place, which, as is clear from medieval references, must have been at the foot of the rock. Throughout the active history of the castle the harbour was of vital importance, as the sea provided the most easy and natural—sometimes the only possible—means of communication with bases of supply. The present appearance of the marsh makes it difficult to realize that a harbour once existed at this spot. There is reason to believe however that the river Dwyryd, which flows directly into the head of the bay, formerly ran across the marsh at the foot of the high ground, passed close under the castle rock, and fell into the sea some little distance to the south-west of it."

With these general conclusions I agree, but I do not think there is any evidence that the Dwyryd ever took the course suggested above. The view that it took this course is derived mainly from W. Ashton's 'The evolution of a coast-line,' which, although of interest and containing many facts, is often misleading in its interpretations. Ashton bases his view on local hearsay evidence of a former stream-bed about a mile north-east of Harlech, on Talsarnau being a village where there was a crossing of the stream, and particularly on the inset-map of Harlech castle on Speed's map of Merioneth-

shire. I suggest that Speed's map cannot be relied on for detail such as this, and the broad river Ashton referred to on this inset-plan seems to me to be the open water of Traeth Bach and not the southward-flowing Dwyryd.[1]

Other evidence is derived from a study of the air mosaic and from a study of the shore processes and features in this part of Cardigan Bay, which show that the drift of beach material is northwards. In early days, probably shortly before Edward I built the castle, we may reasonably suppose that what is now Morfa Harlech began as a small spit south of Harlech. As time went on the Morfa gradually grew until it reached the condition it was in before the embanking in 1808. It is clear from what can be seen now and from the air mosaic that marsh creeks, probably of some size, existed within the dunes, and my own view is that the havens and creeks referred to are those of the marsh within the spit, which in Edwardian times had grown only a short distance from its starting-point. With the conquest of the Welsh and also with the continued growth of Morfa Harlech the castle declined in importance. But probably for some centuries it was still possible for small boats to come round the north of the growing spit, which could not have reached to the high ground of Llanfihangel for some time, or even round the high ground itself, and make their way up towards Harlech. After the final embanking all such traffic would be shut off and the marsh would soon attain something of its present form. Possibly the Dwyryd formerly flowed south of Llanfihangel as it did to the south of Ynys Gifftan as late as 1816; but there is no evidence that it did, and a study of the local physiography suggests that a course north of Llanfihangel is more probable.

The hypothesis outlined here is consistent with the use of Harlech as a port in early Edwardian times, and also with the processes of coastal evolution. It also agrees with the fact that in the fifteenth and later centuries Harlech ceases to be mentioned as a port, but this may be due to purely historical reasons. A tidal creek or creeks joining the Dwyryd between Talsarnau and Llanfihangel and gradually silting up seems to the writer best to explain the few known facts.

Before leaving the Harlech area a word should be said about the "cliff" which runs from Harlech to and beyond Talsarnau. At one time its foot was certainly washed by the sea. But it is not a simple cliff cut at present sea-level. It is a vast structure and would require an enormous amount of erosion to produce it. Yet it is in one of the most sheltered parts of Cardigan Bay. The cliffs immediately south of Harlech, now protected by the railway embankment, are cut in boulder clay, and may be assumed to be due to marine erosion. It is also pertinent to point out that the high ground behind Morfa Dyffryn, which at one time must have been washed by the sea, shows little, if any, evidence of cliffing, although it was originally in a much more exposed position. There is minor cliffing on Lasynys and a normal amount on what was the exposed western side of Llanfihangel.

[1] It can just as easily and certainly more convincingly be argued that the arm of the sea running inland towards Harlech and east of Llanfihangel-y-traethau on Speed's county map of Merionethshire represents a former creek. The inset-map hardly agrees with the smaller-scale county map, and neither, in my opinion, supports Ashton's interpretation.

Morfa Dyffryn

Morfa Dyffryn is in many ways similar to Morfa Harlech. It is an extensive sand-flat attached to the old coast, and fringed on its outer side by dunes. In the southern part of the area there is little dune growth. From the railway embankment at Llanaber a tongue of shingle extends northwards as far as the main exposure of the submerged forest. The supply of shingle is now largely cut off by the railway works. Furthermore, between Llanaber and Tyddyn-mawr the shingle has in recent years been pushed in some places about 80 yards landwards over the marsh, and it has also been broken through, so that a gap of some 300 yards now virtually separates it into two main masses. Within this southern area, and bordered inland by the railway, is a freshwater swamp with abundant *Scirpus lacustris* and *Phragmites*. Occasional incursions of salt water flow into this in storms and exceptional tides. North of this swamp the shingle extends along the coast as far as the mouth of the Afon Scethin, which it has slightly deflected to the north. The sand on the foreshore, in its northward movement, also helps in this deflection. For about half a mile south of this river there is a narrow and wind-eroded dune-belt, but the shingle protects it from direct sea attack. There is some shingle north of the Scethin mouth, and this has advanced rather more than a mile since the survey for the 6-inch Ordnance Survey map of 1901.

For about a mile north of the Scethin the dunes form a fairly simple fore-dune system, much cut up by both marine and aeolian erosion. They are almost throughout their length advancing inland. The flat ground within them is best described as sandy pasture. But north of Dyffryn golf links the dune system widens and forms the finest area of wind-blown sand along Cardigan Bay. There is first an outer and much-eroded line of fore-dunes. In one short stretch they are of peculiar interest. The prevailing wind is south-westerly, and the western side of the dunes should presumably suffer most. But along the stretch referred to, although small blow-outs have cut through the dunes, it is their leeward sides which are eroded away leaving a narrow ridge 20–30 feet high, which falls seawards as a marram-covered slope. The lee side is precipitous and has been destroyed. It appears as if the wind, after making the blow-outs, had widened them sideways, and so caused the removal of the sheltered side of the ridge. The new sand blown from the foreshore replenished the windward side and, with the help of marram grass, maintained it *in situ*. Interesting and bizarre forms are seen in the dunes all along this seaward side of the main dune area. In one place a high pyramid of unvegetated sand was a prominent landmark in 1938. As it is unprotected, it cannot last long. The inner edge of these dunes is advancing over a large low, containing much *Juncus acutus* and *Salix repens*, which separates them from a prominent inner line of moving dunes. These, like the corresponding feature on Morfa Harlech, are formed largely of bare sand and are advancing over the pastures within.[1] They represent an old fore-dune system outside of which the present fore-dunes have originated on a prograding shore-line.

[1] The approximate rate of travel at the fastest point as deduced from our survey and the current edition of the 6-inch map is about 20 feet a year. As the Ordnance Survey does not indicate clearly the inner edges of dune belts, estimates such as this are open to correction.

The inner dunes are often pitted in their older and better vegetated parts by deep and narrow blow-outs, most of which seem to have been started by rabbits.

At the northern end of this system there is a broken mass of old dunes enclosing small lakes. These dunes formed alongside the former course of the Afon Artro before it was deflected in about 1819 to its new mouth north of Mochras Island. The lakes or ponds lie in low hollows to which small streams drain, and are comparable to the freshwater marsh on Morfa Harlech. In their deeper parts (*i.e.* more than 1·5 feet in September 1938)[1] *Scirpus lacustris* and *Sparganium ramosum* are dominant. *Chara* is found nearly all over the floor of the ponds. The shallower marginal parts of the deeper pools have the same flora as the shallow pools nearby—namely *Heleocharis palustris* (dominant) and *Litorella lacustris*, with *Chara* covering the bottom. The old mouth of the Afon Artro is blocked at its seaward end by the fore-dunes which run in an unbroken line until they merge with Mochras. Within them the level falls to the marshy ground described below. Apart from the lakes already alluded to there are also several well-marked *Salix* lows.[2] Alongside the lakes there are one or two small lows which would be wet in winter.

Mochras Island is formed of boulder clay and is an old moraine. It bears to Morfa Dyffryn a relationship similar to that existing between Llanfihangel and Morfa Harlech. The boulder clay supplies abundant material for coarse shingle which spreads over all the beach alongside it. This shingle travels northwards, and the north-eastern part of Mochras is a long shingle spit (recently protected) with dunes which curves round in typical fashion at the mouth of the river. At low water only a shallow channel exists, and the shingle really continues north of the river, where it forms another shingle-and-dune spit running northwards by Llandanwg church to join the boulder-clay cliffs south of Harlech. It is therefore correct to say that the shingle which begins at the southern end of Mochras is continuous with that outside Morfa Harlech, the places where it is less in amount being explicable as a result of artificial changes.

Within Mochras is a broad sand-flat which fills at high spring tides. Along its southern edge the vegetation is of much interest, and is largely of fresh-water origin. It is occasionally flooded by the tides and so represents a transitional stage. The following species are co-dominant and grow in juxtaposition: *Scirpus lacustris*, *Phragmites communis*, *Scirpus maritimus*, and *Juncus maritimus*. These grade northwards into normal salt marsh which is growing over the sand-flats. *Salicornia* spp. and *Statice* (*Limonium humile*) are common, but are scattered and do not form a close cover. The best development of salt marsh in this area occurs north of the Afon Artro and near Llanbedr and Pensarn station, where a clear transition is seen from the lowest or algal zone, through scattered *Salicornia*, to a *Glyceria* sward, and finally to the *Juncus* belt. A small amount of inning has been done north of the river, but the sea-wall follows the eastern side of the flat within Mochras and runs back to the main road. Outside this wall, and facing Mochras, the salt marsh, though narrow, is well developed and shows steps or "cliffs" resulting from wave

[1] As on Morfa Harlech there is much more water in these ponds in winter.

[2] Lows with *Juncus acutus* occur; they may be rather lower than the *Salix* lows.

erosion at high water. The straight stretch of road known as Sarn Hir is in itself an embankment and was built before 1806.[1]

The whole area within the Dyffryn dunes closely resembles the corresponding area on Morfa Harlech and need not be described in detail. North of Dyffryn village the ditches drain to the north. South of the Afon Scethin the drainage is more irregular and a small and unnamed stream breaks through the shingle about a mile south of the Scethin. Llandanwg church was certainly not built when the sea was so close to it. It is now disused, and, but for clearing, would be nearly covered by dunes. No record is known to exist which describes its position relative to the sea when it was built.[2]

The submerged forest series near Llanaber was well seen in 1938. Part of it has been described by T. N. George,[3] who says that the underlying "silt and clay rest at a height of about six to eight feet below high-water mark at its landward edge, but sloping noticeably seawards." Later he writes: "For although the peat is not present above the silts at Barmouth and Llanaber, . . . the presence of rootlets in the silts . . . is conclusive evidence of the one-time extension of an ancient soil over that ground, since removed by denudation." In 1938 there was a considerable area of peat exposed. The top surface of this was levelled and connected with a bench-mark on the main road. It was established that the top surface of the inner edge (*i.e.* the highest part) of the peat was between 13 and 14 feet above Ordnance Datum. An excavation was made through the peat at this point, and showed that the whole layer was about $5\frac{1}{2}$–6 feet thick. Throughout this particular section the peat was typical of a shallow-water and possibly brackish lagoon, and consisted mainly of the remains of *Phragmites* and similar plants. The shingle had been removed from this upper surface. Seawards there was a small cliff, about 2–3 feet high, and then came the main exposure. On the upper surface of this lower platform there are numerous alder stools, many of them in the position of growth. Careful observation and excavation showed that they were all in a layer between 18 inches and 2 feet above the underlying blue clay. Ordinary neap tides would scarcely cover this lower layer; spring tides would reach up to and probably slightly above the topmost layer. Behind the peat is a lagoon, and it is probably correct to say that much of the peat accumulated under similar conditions. It seems unlikely that this peat bed is identical with that exposed at lower levels on the coast.

South of Llanaber Halt, which stands on a minor salient of the coast-line, there is at Barmouth a slight residual travel of beach material to the south. This appears to be local, but is often mildly evidenced by the groynes along Barmouth promenade. I cannot explain this point: the alteration in the angle of the coast at Llanaber seems too small to be the effective cause, although it is more noticeable on the ground than it is on a map. Barmouth itself stands on a narrow flat, probably of similar origin to Morfa Dyffryn. Although no authentic records are available, it is known that a certain amount of erosion has taken place at the southern end of the town since it has been a place of any importance. In the years 1550–1603, when it was called Abermowe, it

[1] I do not know the precise date.
[2] See *Arch. Camb.*, vol. 90, 1935.
[3] *Proc. Swansea sci. Fld. Nat. Soc.* 1 (1933) 187, 188.

consisted of four houses, and possessed but two little boats (E. A. Lewis, Welsh Port Books, 1550–1603, Cymmrodorion Record Series No. 12). From Ynys y Brawd, at the mouth of the Mawddach, a pebble ridge runs westward, and consists of glacially transported material with many marine shells. It has been suggested that it is a relic of a raised beach.[1]

Fairbourne and Ro Wen

As this account deals only with accumulation and erosion features of the coast-line, it will not take into consideration the probable origin of the Mawddach and similar estuaries. These have been discussed by O. T. Jones.[2] Ro Wen is a typical storm beach of coarse pebbles, and near its distal end shows several minor recurved ridges. It is unlike Morfa Harlech and Morfa Dyffryn, but is the counterpart of the spit across the mouth of the Dovey. It has been built by northward-directed beach drift, and as a result of storm attack is set well back from the general trend of the coast from Llwyngwril to Fairbourne. Throughout most of its length it is covered by simple, but much eroded and patchy, dunes. This is often due as much to human interference as to natural causes.

Within the spit is an interesting development of salt marsh which is more muddy than any other dealt with in this account: this is probably due to the river. Sheep graze on the unreclaimed marsh and give it a lawn-like appearance. The marsh rests on bare sand-flats colonized over large areas by *Salicornia* spp., near the inner edge of which a fair amount of silt has accumulated. The next higher zone includes *Glyceria* as the dominant plant, with *Suaeda maritima*, *Salicornia* spp., *Armeria*, and *Glaux*. There is no clear separation between these two lower zones. A slight break of some 4 or 5 inches introduces a third zone characterized by *Armeria* (dominant), *Festuca*, *Spergularia*, *Glaux*, and *Suaeda maritima*. The highest zone, about 1 foot above that just described, is shown by the dominance of *Festuca*. The other important plants are *Armeria*, *Plantago coronopus*, *Glaux*, *Spergularia*, and *Agrostis alba*. On the bare mud-flats nearer Barmouth Junction station are three patches of *Spartina Townsendii*. Whether these were introduced naturally or artificially is not known. On a small scale this marsh is similar to the Dovey marshes. Pans and creeks occur, but are not very well developed. Reclamation has been carried out, and most of the area is now agricultural land. These marshes were continuous with those at Arthog, but are now separated by the road and railway. Near Arthog station is a fine development of an *Aster* marsh, and near Fegla Fawr is an excellent example of a raised bog with characteristic vegetation, *Molinia* being the dominant plant.

Summary

In the descriptions given of the various shore units between Pwllheli and Fairbourne it will be seen that the most conspicuous feature is the movement of beach material towards Tremadoc Bay. Along the Lleyn coast this material moves eastwards, and along the coast of Merionethshire, with perhaps a local and unimportant exception at Barmouth, it moves northwards. Both

[1] T. N. George, *loc. cit.*
[2] *J. Ecol.*, vol. 5, 1917.

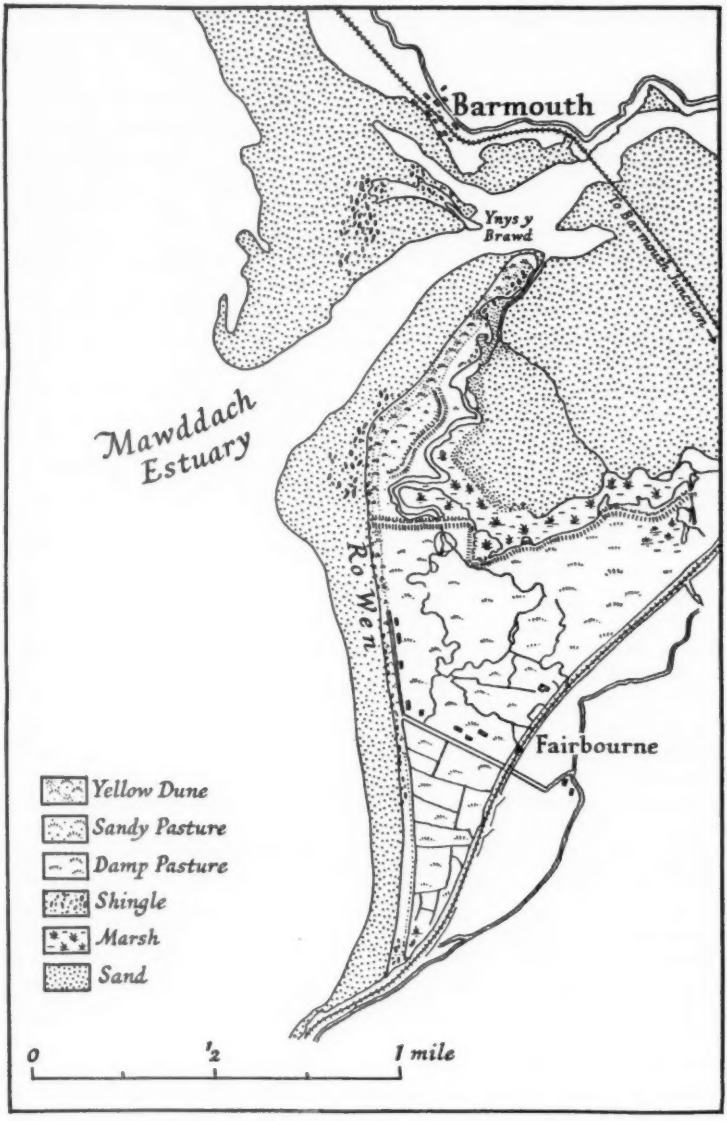


Fig. 2. Fairbourne marshes and Ro Wen

movements are the result of the same cause: the prevalent south-westerly winds. On both shores these winds cause waves to strike the shore at an oblique angle and induce movement of beach material in the way described.

Some material may have been brought down in the past by the rivers Glaslyn and Dwyryd. This material helped to shallow Tremadoc Bay. To what extent this process has taken place relatively to beach-drifting it is now impossible to state. But their combined effects have worked in the same direction. More and more material has gathered in this north-eastern re-entrant, and has produced the great sand-flats. Waves coming into this region have therefore been forced to break on a constantly shallowing bottom. This in its turn implies that with the increase of sand the waves have been constrained to break progressively farther from the mainland, although this process has been subject to variations. Consequently Morfa Harlech and Morfa-bychan have grown seawards, and both show the characteristic attempt to turn their outer beaches at right-angles to the main direction of wave approach in the way that Lewis [1] has suggested. Between them the rivers have maintained an open channel. In the sheltered areas, *e.g.* Talsarnau and Penrhyndeudraeth, conditions have been favourable for marsh development. The same general processes are apparent along Morfa Dyffryn. It too has grown northward and seaward and has incorporated Mochras. On a smaller scale we see the same thing happening west of Graig Ddu and west of Pen-ychan.

The process is still going on in Tremadoc Bay. The extensive sand-flats outside Morfa Harlech supply abundant quantities of sand for new dune growth. A study of maps over the past hundred and twenty years shows clearly a general northward and seaward growth of Harlech Point. On the other hand there has been erosion of the foreshore of that part of the foreland west of Cefn-mine.[2] It would be interesting to speculate what would have happened if the railway embankment had not been built along the foot of Harlech cliffs, and had not cut off the supply of available shingle. This also prompts the suggestion that shingle should underlie parts of the southern end at least of Morfa Harlech. Before the building of the railway, cliff erosion must have been considerable, and much of the material ought to have moved northwards. None however is visible at the present time. A similar view is also applicable to the southern end of Morfa Dyffryn and the protected cliffs at Llanaber.

Fairbourne spit shows the same northward growth, though it too seems to have attained a maximum, and the Mawddach is able to keep free its mouth. Farther south the same northward drift of shingle is clearly seen from the boulder-clay outcrops at Llwyngwril and Towyn, and in the great spit across the Dovey estuary.

Apart from the erosion of exposed cliffs, the gradual accumulation of material in the way described, the development of salt marshes, and the

[1] *Proc. Geol. Ass. Lond.*, vol. 49, 1938.

[2] The great storm of 23 November 1938 again illustrated this point. The western side of Morfa Harlech was considerably eroded, as could be seen in the dunes in December 1938.

effects of severe storms, as in November 1938,[1] the other active processes at the present time are the variations in the lower courses of the Glaslyn and Dwyryd, which cause irregular erosion of Talsarnau and Harlech marshes and of the dunes of the east side of Morfa-bychan.

The salt-marsh areas are, to any one familiar with East Anglia, disappointing. In the Traeth Bach there is conspicuous absence of fine silt and mud,[2] and the marshes are really a grass sward growing immediately on a sand-flat. Certain zones can be distinguished. The creeks are largely governed, as far as their detailed form is concerned, by the undermining of the upper 6 inches or so of soil which is of finer and more coherent material than the underlying sand. The rounded or oval pans are normal primary pans, but the creek banks are so often cut away that channel pans or even, at a rather later stage, lines of holes are common. The Fairbourne marshes consist of bare sand-flats, but more mud is gathering on them than on the Dwyryd marshes. They are comparable with those described by Yapp in the Dovey. The transition to brackish or freshwater marshes is well seen inside Mochras and in Morfa Harlech.

This paper has been concerned solely with modern coastal features, and no reference has been made to the most striking phenomenon of this part of Cardigan Bay—Sarn Badrig, or St. Patrick's Causeway. This great submerged ridge of coarse boulders runs south-westward for several miles from Morfa Dyffryn about a mile south of Mochras, and is partly exposed at low spring tides. It is one of several such features whose origin involves a discussion of the sunken land of Cantref y Gwaelod. The references below [3] will give those interested the best account of the problem. It cannot be too strongly emphasized that extreme care should be taken to separate fact from fiction in the accounts of the earlier writers on these matters.

[1] The effects of a storm were well shown in Cardigan Bay on 23 November 1938. The waves did great damage to the sea-wall at Talsarnau, and the reclaimed marshes were flooded by 5 feet or more of water. Drift material could still be seen (December 1938) on the top wires of fences. The same storm also severely eroded the boulder-clay cliffs east of Afon Wen station, and also those west of Criccieth. All the low-lying area at Fairbourne was flooded, and the station at Penrhyndeudraeth was under water. Ballast was removed from the railway line near Llandecwyn Halt, and much shingle pushed over the line just north of Llanaber Halt. The train service was disorganized for about ten days. (See the *Western Mail* and the *Liverpool Daily Post* for details and pictures on 24 November 1938.)

[2] There is a greater proportion of fine material alongside parts of Talsarnau wall.

[3] O. T. Jones, "The origin of the Welsh legends," *The Welsh Outlook*, January 1921; D. J. Davies, "Cantref y Gwaelod," *Trans. Cardiganshire Antiq. Soc.*, vol. 5, 1927 (contains full references to earlier writers); H. J. Fleure, "Archaeology and folk tradition," *Proc. Brit. Acad.*, vol. 17, 1931 (Sir John Rhys Memorial Lecture).

MOVEMENT OF MINERS IN THE SOUTH WALES COALFIELD

EMRYS J. HOWELL

WORKERS in the field of localization of the industrial population have often found the validity of their statistics marred by large-scale daily mobility of labour between domicile and workplace. This must be borne in mind when examining, *e.g.*, the Occupation Tables of the decennial census reports of large urban districts such as London, where exceptional facilities for daily travelling exist, and, in fact, Census officials took care to mention these limitations in this particular instance. One is used to hearing of long-distance travelling by professional persons from suburb to business centre, and of the daily influx of typists and shop assistants from satellite villages to a neighbouring township, but the artisan worker is regarded as a person who lives as near his workplace as possible. The purpose of this paper is to describe daily movements of persons engaged in the coal-mining industry of part of South Wales: an area and an industry which provide an exceptional field of investigation into the detailed geographical distribution of a section of the artisan class. Since the major dispute in the industry in 1926 a legislative attempt has been made to limit the inflow of new adult labour and hence reduce the surplus mining population, for by Section 18 of the Mining Industry Act (1926) no person over the age of eighteen years when making an application for employment, who was not employed at a colliery before 1926, can be legally engaged. This restrictive measure has led to a readjustment of population within the coalfield. The more prosperous areas have tended to attract displaced labour from the less fortunate, partly by migration,[1] partly by long-distance travelling.

Less obvious is the detailed changing face of the coalfield. As with all extractive industries, the source of raw material sooner or later becomes unprofitable to work, and in the present area we find a process of rationalization: the confining of attention to economically worked pits, and the temporary closure of collieries when their quota of coal production is exhausted. The miners who worked at collieries now closed seek new employment at others. The whole story of mass emigration from South Wales reveals that the balance generally weighs against them; but, as will be shown, a small proportion find employment at collieries within daily travelling distance from their home. Internal differences in prosperity within the coalfield are ultimately due to the occurrence of distinct types of coal in definite areas of the field. In one of the most well-defined regions in the north-western corner anthracitic coal occurs. Here relative prosperity in recent years has attracted workers not only from the eastern steam-coal areas, but also from the southern coastal towns where coal-mining is not now the dominant occupation of the industrial population. It is proposed to deal in some detail with daily movements of coal-miners within this anthracite area.

The first attempt to estimate the extent of daily travel within the coalfield

[1] Brinley, Thomas, "Labour mobility in the South Wales and Monmouthshire coal-mining industry, 1920–30." *Econ. Journ.* 41 (1931) 216.

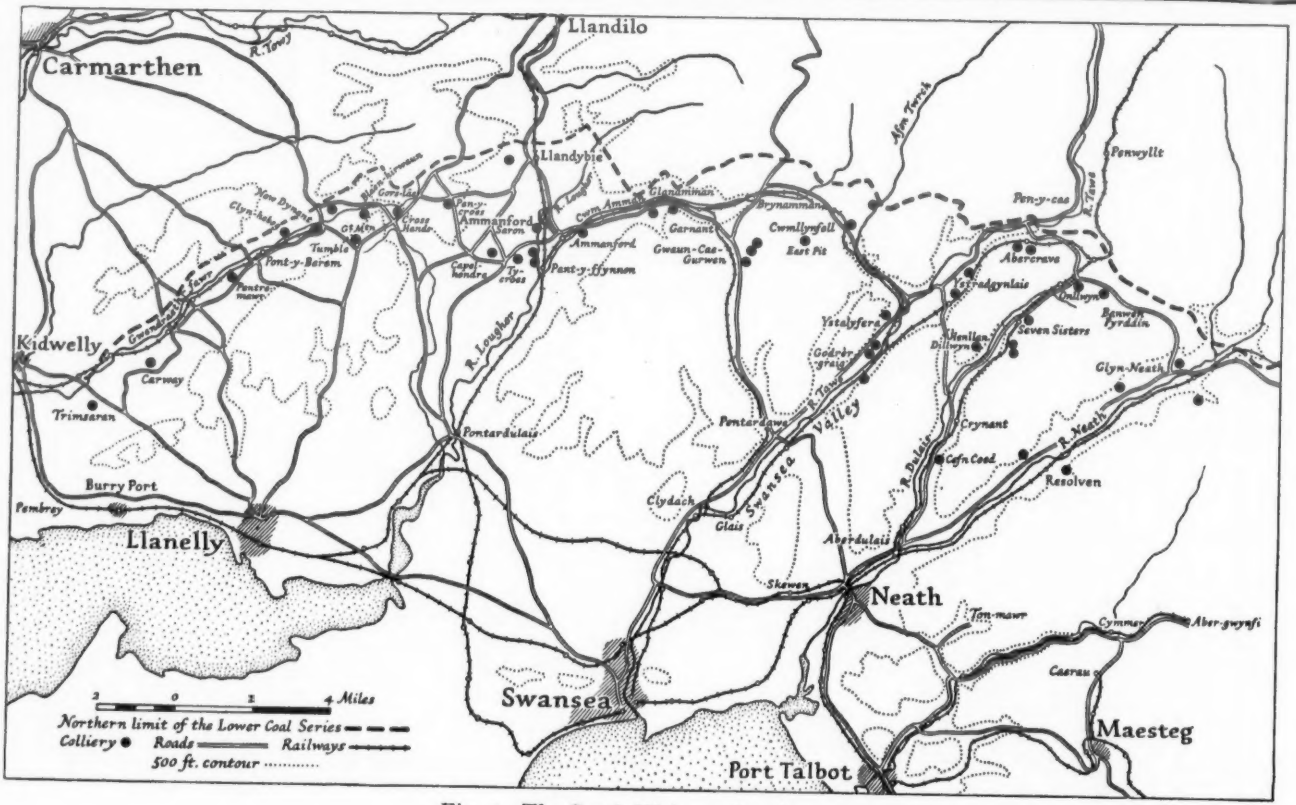


Fig. 1. The South Wales anthracite area

was made in a survey compiled for the Board of Trade and directed by Professor H. A. Marquand.[1] The method adopted was simple. A questionnaire was issued in June 1936 to each colliery, in order to ascertain (*a*) to what extent workmen have to travel comparatively long distances to and from their work and the number living in the immediate vicinity of their work; and (*b*) the means of transport used, either road or rail. The present survey was made in the early months of 1938, when the addresses of some 23,000 colliery workmen in the anthracite area were consulted at the offices of forty-four collieries. These addresses were then classified according to the village or town from which these persons travelled to work daily. It became clear from this work that the geographical distribution of employees varies considerably even for neighbouring collieries. At some, a restricted mining community is nucleated within a few miles of the pithead, while at others over 50 per cent. of the daily immigrants live over 11 miles away. This emphasizes the fact that distribution of employees may be peculiar to one colliery or group of collieries, and may be due to the physiography which has influenced the growth of settlements in the past.

The main boundaries of the anthracite area (Fig. 1) coincide with the northern outcrop of the Lower Coal Series in east Carmarthenshire and west Glamorganshire. It is not only structurally demarcated, but physiographically also. In the Lower Coal Series a depression has been etched between the Carboniferous Limestone to the north and west and the Pennant Sandstone Series which outcrops in high land to the south. This longitudinal depression is well developed in the Gwendraeth and Amman valleys, but is not so well defined in the eastern part of the area lying in Glamorganshire. To the south the workable coal seams dip below the Pennant Sandstone escarpment and have not been mined there to any great extent except where the deep incisions of the Tawe, Dulais, and Neath river valleys make them accessible. If these rivers, together with the Loughor, had not carved deep transverse valleys, cutting right across the coalfield, generally in a N.E.–S.W. direction, direct communication between the anthracite area and the coastal districts around the populous industrial boroughs of Swansea and Neath would be difficult. Major roads in the eastern part of the area lie along these valleys, but west of the Loughor river the upland is less forbidding, and a meshwork of roads, mainly transverse to the trend of the Gwendraeth valley, brings within easy access the industrial belt of Llanelly and Pontardulais to the south, and the agricultural centres of Carmarthen and Llandilo to the north. In this western sector there are many nucleated agricultural villages, each with a small population, linked by road with the larger villages of the mining zone. In the eastern sector, from Ammanford to Glyn Neath, the physical outline precludes a scattered distribution of villages except along the valley floor. In the former area the collieries considered here fall into two groups: 9 collieries along the Gwendraeth-fawr valley, from Trimsaran to Cross Hands, and continued northwards to Penygroes and Llandybie; and 6 collieries around Ammanford. In the latter area there are 6 collieries along the Amman valley, from Glanamman to east of Gwaun Cae Gurwen; 8 collieries in the upper part of the Swansea valley, with 2 others in the tributary Twrch valley;

[1] H. A. Marquand, 'A second industrial survey of South Wales.' Cardiff. 1937.

7 collieries in the Dulais valley; and 5 in the Neath valley, at Resolven and Glyn Neath.

The Gwendraeth valley. The area from which miners are drawn to the collieries here is an extensive one. Each small village within easy access by road, and in some cases by rail also, contributes a complement depending upon its distance from the colliery. The most active section of this valley is where the New Dynant, Blaenhirwaun, and Great Mountain collieries are located. Farther down the valley are the Glynhebog and Pentremawr pits, while those at Carway and Trimsaran in the lower reaches are somewhat removed from the others. The employees at these are local, but workmen at the Blaenhirwaun colliery travel daily from forty villages within a 12-mile radius, while men from eleven other villages outside this limit find lodgings near their work. At Trimsaran colliery employees are drawn from fifteen villages only.

THE DISTRIBUTION OF EMPLOYEES AT SELECTED COLLIERIES

Sub-region and colliery	*Distance in miles of home address from the colliery*						*Totals*
	0–1	1–3	3–6	6–8	8–11	*over* 11	
Gwendraeth							
Trimsaran	229	48	23	1	0	0	301
Pentremawr	445	200	54	1	119	3	822
Glynhebog	258	54	52	7	69	10	450
Blaenhirwaun ..	196	232	68	17	23	7	543
Great Mountain ..	536	265	98	67	43	7	1016
Ammanford district.							
6 collieries	1267	768	72	15	3	3	2128
Amman valley							
Glanamman	100	29	72	3	3	1	208
Gwaun Cae Gurwen (3)	872	658	34	21	1	8	1594
East Pit	0	486	303	12	5	1	807
Swansea valley							
Abercrave (2) ..	460	109	114	21	5	3	712
Ystradgynlais (2) ..	383	597	72	2	2	3	1059
Ystalyfera (2).. ..	322	98	107	8	6	4	545
Dulais valley							
Onllwyn (2)	936	102	37	10	135	370	1590
Henllan (2)	0	148	105	25	182	0	460
Cefn Coed	0	344	447	82	224	61	1158
Neath valley							
Glyn Neath (3) ..	1944	0	176	0	381	586	3087
Resolven	290	0	25	3	3	23	344

The table gives the numbers of employees at selected collieries who travel daily various distances to the pithead. No account is taken of distances travelled underground by workers at the coal face, which in the older collieries may be 1 or 2 miles. A cursory examination of the statistics for the Gwend-

raeth valley shows that the majority live within 3 miles of a colliery. At Pentremawr, near the village of Pontyberem, more than half the total employees live within walking distance of their work, but good transport facilities by road and rail to this colliery account for the unusually large proportion in the 8–11-mile group. The localization of coal-miners in this district is reflected in the fact that the number now employed at the Pentremawr and Glynhebog collieries represents 50 per cent. of the 1931 male population of Pontyberem civil parish. Were males below the age of fourteen years, unemployed miners, daily efflux to other collieries, and recent emigration of surplus labour taken into account, the proportion of persons connected with coal-mining might be 70–80 per cent. of adult males living within the parish boundary. There has been little recent immigration to this part of the Gwendraeth valley, for though the quality of anthracite is of the highest, the demand for the best coal has seriously contracted in post-War years. It is the valleys where anthracite of a comparatively low grade occurs that have shown expansion and a concomitant activity in movements of workers.

The group of collieries at the head of the Gwendraeth valley, though situated near the large villages of Tumble and Cross Hands, attract miners from over a wide area. The numerous roads are a major factor determining this scattered distribution, for nearly every village is served by bus or by a private lorry chartered by the miners. In several instances, villages off the main service routes would still have no direct communication with neighbouring large villages or towns were it not that the demand for transport to collieries had first prompted bus companies to serve them. The miners enjoy certain privileges granted by these companies, *e.g.* a return journey at the normal fare for a single journey and augmented service at appropriate times. It is not surprising therefore to find considerable numbers travelling distances up to 11 miles each way daily. The neighbouring agricultural villages of the extra-anthracite area of Carmarthenshire, especially townships in the Towy vale, contribute strongly to the daily immigrant labour supply of Gwendraeth valley collieries. These persons must necessarily have been engaged in the industry for a number of years and have travelled the long distances daily. Similarly the southern margin of the coalfield supplies immigrant miners from the coastal districts of Pembrey, Burry Port, and Llanelly.

The Ammanford district. The six collieries in this area draw most of their labour from the Ammanford urban district, built on the low-lying ground at the confluence of the Loughor and Amman rivers, and from the neighbouring villages of Tycroes, Pantyffynnon, and Hendre. The town of Ammanford contributes 454 from a total of 513 workers at the Ammanford colliery. The number of villages supplying employees at this and the other collieries in the group is far less than that noted for those at Cross Hands and Tumble. A fair amount of cross-travelling occurs between the villages of Saron, Hendre, and Tycroes, near Ammanford, and those of Cross Hands, Gorslas, and Penygroes, chiefly in favour of the latter district.

The Amman valley. This sub-region consists of a narrow lower, or western, sector where the villages of Garnant and Glanamman lie, and a wider upper, or eastern, sector where Gwaun Cae Gurwen, with its large

collieries, and Brynamman are situated. Along the one road of the valley long lines of habitations stretch for several miles, even where the physical outline would permit nucleated settlement: the ribbon development is a reminder of the unplanned rush to cope with an influx of immigrants during the closing decades of last century and, mainly, the opening decade of the twentieth. In spite of the fact that there are several hundred wholly unemployed miners in the Cwmamman urban district, the two collieries within its boundary draw much labour from outside. From a total of 583 persons employed there, 436 live at Glanamman and Garnant; the majority of the remaining 149 persons travel daily from Brynamman, Gwaun Cae Gurwen, and Ammanford. Thus the distribution of employees at these two collieries assumes the shape of a dumb-bell with the Ammanford township and the Gwaun Cae Gurwen and Brynamman district at either end. This is determined by the topography and distribution of settlements.

As in the Ammanford district the coal-mining population of the Gwaun Cae Gurwen area, with four large pits where 2400 persons are engaged, is self-contained. Two notable features emerge: fair numbers of workmen travel daily into the district from the Swansea valley, aided by a good road and frequently served by several bus companies; and the large village of Brynamman, a few miles north of Gwaun Cae Gurwen, contributes an exceptional proportion towards the total employed at the four pits. Brynamman is in fact directly comparable with other towns along the northernmost margin of the South Wales coalfield, *e.g.* Merthyr Tydfil, Ebbw Vale, Aberdare, and Brynmawr, in having become a dormitory for miners who nowadays find employment farther south. This is due to the exhaustion of coal supplies and the abandoning of communities high and dry as the tide of coal exploitation necessarily ebbs southward. Brynamman was formerly a prosperous coal-mining village which, in the 'seventies of last century, attracted tin-plate works (dismantled in 1897), but very rapid exhaustion of the easily worked coal outcrops has now left the district one of numerous derelict coal-tips, abandoned works, and severe unemployment. Of 29 Brynamman persons engaged at a Gwaun Cae Gurwen colliery during four years preceding 1938, 26 had been previously employed at Brynamman collieries now closed.

The Swansea valley. The mining community at the head of the Swansea valley consists of nearly 5000 persons directly concerned with the getting of anthracite coal. Four thousand are employed at ten collieries situated between Godre'r Graig and Abercrave, and in the Twrch valley. It is an entity that receives little supplement from neighbouring valleys, but there is a good deal of longitudinal travelling and of cross-travelling along the valley floor. A large proportion of the mining population lives at Ystalyfera and Ystradgynlais. At the Abercrave collieries 460 persons from a total of 712 live within easy walking distance of their workplaces. There is some migration down the valley from the villages of Penycae and Penwyllt, but the main stream of immigrants flows northwards from Ystradgynlais, 4 miles distant, and from other villages farther down the Swansea valley. At the two Ystradgynlais collieries labour is very largely obtained from within 3 miles, but 45 persons travel southwards from Abercrave and 54 northwards from

Ystalyfera. The movement from villages south of the latter is negligible, and in spite of good road communication with the Dulais valley no westward movement of miners takes place. The other anthracite collieries of the Swansea valley occur near Ystalyfera. In this narrower part of the valley longitudinal travelling is greater than in the districts farther north. A large percentage of local labour is employed, but the number from the confluence village of Pontardawe is considerable, and, less so, from Clydach and Glais.

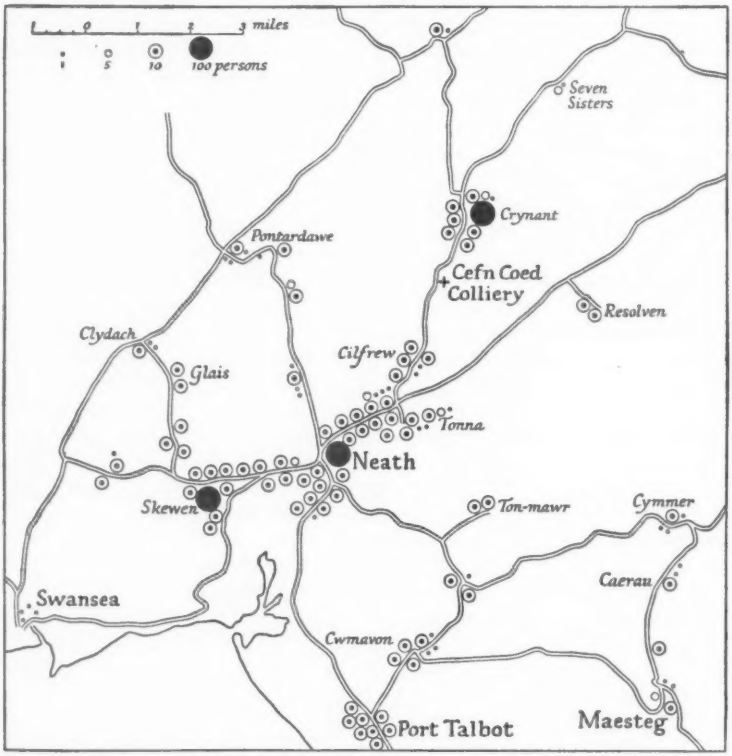


Fig. 2. Distribution of employees at the Cefn Coed colliery

The Dulais valley. This is an offshoot of the Neath vale, and in many aspects its recent economic history is similar to that of the main valley. Both are areas of increasing exploitation. Apart from the Cefn Coed colliery, which is situated about 3 miles north of the confluence of the Dulais and Neath rivers, collieries to which reference is made here are placed in the upper reaches of the Dulais valley, near Seven Sisters and Onllwyn. The seven collieries give employment to nearly 5000 persons. The total of males of all ages enumerated in 1931 in the parish of Dylais Higher, which extends to include the villages of Crynant, Seven Sisters, Onllwyn, and Banwen, was

3554.[1] It is clear therefore that over 2000 must enter the valley daily to work at the collieries, and, as this mining area is fairly isolated, the distances covered by daily immigrants are likely to be high.

The Dulais region is in direct communication with the borough of Neath by both road and rail, and with the adjacent Swansea valley by a road from Crynant to Ystradgynlais, and by an extension of the Crynant–Seven Sisters road to Abercrave. It is impassably separated from the neighbouring mid-Neath vale along its whole length, but the Onllwyn and Banwen district in the extreme north is connected with Glyn Neath by a road but recently constructed.

The distribution of workers at the Onllwyn collieries is given in the table on p. 231. Influx of imported labour from the north is about equal to that from southern towns and villages. In 1936 there were 57 persons who travelled the 16 miles from Merthyr Tydfil daily[2]; by 1938 this number had risen to 98. The increase during this period in Aberdare persons was greater: from 31 to 110. Aberdare is 11 miles from Onllwyn. About 20 per cent. of the persons from Neath travel up the Dulais valley to Onllwyn by train, the remainder by road, as also do those from other districts outside the valley. Public transport facilities are inadequate to cope with the large numbers of miners, who therefore charter private buses and so are able to reach their workplaces more quickly and more cheaply than those in the Swansea valley who are entirely dependent on service buses.

The geographical distribution and means of transport of men and boys employed at the Dillwyn-Henllan collieries, situated near the point of departure of the Swansea valley junction road, are indicated in the following table:

Town or village of home address	*Men*	*Boys*	*Distance in miles from colliery*	*Means of transport:* *road*	*rail*
Crynant	90	5	2	80	15
Seven Sisters ..	45	8	1½	45	8
Banwen	4	1	3½	2	3
Ystradgynlais ..	45	5	5	50	0
Cwmllynfell ..	25	0	8	25	0
Brynamman ..	20	0	10	20	0
Aberdulais ..	50	0	6	20	30
Neath	70	12	8½	40	42
Skewen	80	0	10	80	0

The influence of easy communication between these collieries and the Swansea valley is emphasized by the large numbers entering daily from Ystradgynlais, Cwmllynfell, and Brynamman.

The distribution of employees at the Cefn Coed colliery (Fig. 2), can only be explained by the shortage of local labour for a new and expanding colliery. The pit was sunk ten years ago and, owing to the lack of available labour in the upper parts of the Dulais valley, miners who formerly worked in aban-

[1] This number probably approximates to the 1938 figure, for little building of houses has taken place within the valley since the Census date.

[2] H. A. Marquand, *op. cit.*, iii, p. 181.

doned collieries in the Neath, Skewen, and Port Talbot districts have been absorbed. It also reflects the absorption of the surplus labour of the steam-coal-mining districts around Maesteg. These recruits from Tonmawr, Caerau, Cymmer, and Maesteg spend no inconsiderable time daily travelling to and from their new workplace.

The Neath valley. While the account of the Dulais anthracite area indicates the extent to which openings are being found for displaced steam-coal labour, the Neath valley district reveals it much more forcibly. The five collieries considered together have nearly 4000 workers. At three Glyn Neath collieries, where 3087 workers are employed, 1935 or 62 per cent. are localized at Glyn Neath and district, but 928 or 30 per cent. of the total come from Merthyr Tydfil and Aberdare alone, supplemented by a further 59 from

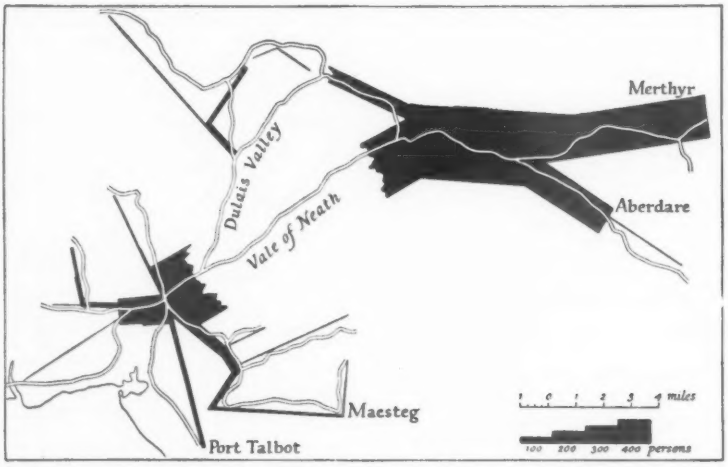


Fig. 3. Routes used by daily migrants into the Neath and Dulais valleys

Hirwaun. The southern, coastal belt contributes but few: 31 from Neath, mainly, and from Skewen and Port Talbot.

The more southerly placed collieries of the Neath valley, at Resolven, though still receiving a large daily influx from Merthyr and Aberdare, are nearer the coastal labour pools, and the distribution for those districts is somewhat similar to that for the Cefn Coed colliery. These collieries seem to have a greater turnover of labour than others, especially since production of anthracite for the Canadian market is mainly in their hands, and a good number of workers are disengaged a week or so before the last boats leave Port Talbot and Swansea (usually at the beginning of November to be in time to reach Montreal before the St. Lawrence river becomes unnavigable). Vacancies are being filled from far afield, for the Ministry of Labour officials at Resolven consult their colleagues at Merthyr and Aberdare. Available statistics for one Resolven colliery for July 1936 showed no Merthyr men, but since that time nearly 100 have been engaged.

The redistribution of mining labour in the western part of the South Wales coalfield is predominantly due to lack of local labour to meet the demands of collieries which are expanding and to the closing of the coal-mining industry by law. Unlike the first decade of the present century, when the main influx of population from extra-coalfield sources took place and houses were haphazardly built to meet the requirements of immigrants, the tendency at the moment, as the above analysis shows, is for miners to prefer long journeys daily to finding homes near their new workplaces. This is due partly to lack of housing facilities and partly to the miner's natural aversion to moving his home, especially when the continually changing face of the coal-mining industry may render such a course inadvisable.

It is a pleasant duty to thank the numerous colliery officials for their cooperation, and Mr. D. Trevor Williams and Dr. L. Dudley Stamp for their assistance and advice.

WHITE SETTLEMENT IN THE TROPICS

WHITE SETTLERS IN THE TROPICS. By A. GRENFELL PRICE, with additional notes by ROBERT G. STONE. *New York: American Geographical Society* (*Special publication No.* 23), 1939. 10×6½ *inches;* xiv+312 *pages; illustrations and maps.* $4.00

THIS important and interesting book is a study of the various factors affecting white settlement in the tropics. The problem is stated at the beginning of the book in three short questions. Why in general have the whites failed? Are they beginning to make progress? Can they hope for ultimate success? In attempting to answer these questions the author has been compelled to approach the subject with a broad outlook and sufficient industry to sift an overwhelming collection of historical, geographical, political, economic, and scientific literature. The records of many types of white settlement are traced and examined critically. The values of the various methods of study are assessed, and uncertain theories are criticized. Most of the early attempts at settlement failed; the reasons for these failures are deduced after careful study of the contemporary historical literature and statistical data. Recently, within the period of scientific invasion, attempts at settlement seem to have been more successful. The new factors underlying these successes are analysed, and the important ones are stressed. To quote from the foreword to the book, the author demonstrates "that the future lies in scientific investigation and that political and economic policies will never succeed unless based on the facts so established."

In the first part of the book the nature and history of the problem of white settlement in the tropics are examined. Here it is clearly stated that the problem must not be regarded solely as a medical one, though the medical aspects are certainly important. To make clear the issues and limit the field of inquiry definitions of the words White, Settlement, and Tropics are given. Settlement is taken to mean colonization, including maintenance of health, physique, and fertility, as opposed to mere sojourning in the tropics. Thus government officials, soldiers, missionaries, and traders who only live part of their lives in the tropics are excluded by definition. By Tropics the author means those regions within the boundary of a mean isotherm of 70°. The problem of white settlement is particularly important at the present time in view of over-population in white countries and colonial conflict. The question of whether

new-comers, like the Italians in Africa, can settle permanently is of very great interest; while recent proposals for the settlement of European refugee whites in British Guiana brings the problem still more into prominence just now.

Hitherto opinions as to whether whites could settle permanently in the tropics were contradictory. The pessimists thought that the tropics would always prove unsuitable, in spite of the gradual solution of medical problems; but the school of medical scientists tended to underestimate the difficulties, and with them such factors as economic conditions and the powers of the white man to acclimatize were taken to be of little account.

From the practical point of view the range of the inquiry can be limited; and for the purposes of this book tropical desert regions and humid equatorial lowlands are left out of the discussion. The regions considered are the tropical highlands, the trade wind coasts and islands, and the wet-dry monsoonal regions where the climate and situation might be suitable for white settlement. Then too regions of dense coloured population are excluded from the inquiry.

The second part of the book consists of a number of regional studies in which, after examination of available data and in many instances personal experiences, the author attempts to draw some conclusions as to the past, present, and future states of each of the regions. Often he is indefinite; though in a few instances, as in the case of Queensland and Panama, he speaks with greater certainty.

The story of white settlement in Queensland seems to offer special lessons which "should be known to all nations who are attempting to develop the tropics." In Queensland the Australian settler starts with a unique advantage in the absence of a teeming coloured population. Whereas in the West Indies white workers began promisingly but later became submerged by the negro population, in Queensland the whites at first suffered ill-health in the presence of coloured peoples, but later met with apparent success. Agricultural settlement in Queensland is limited to comparatively small areas near the coast on account of meteorological factors and difficulties with irrigation. The pastoralist is limited by the climate, but also by competition with the Argentine market. The coalfields however are rich and offer some hope for the future in manufactures. Development is hindered by the high wages that have to be paid. This is not so much due to the climate as to isolation. The outlook is certainly hopeful, though still questionable, in the Queensland tropics.

In the West Indies white races "can survive for centuries against appalling difficulties. . . . It further appears that the whites do best in, and deliberately seek, regions of steady air movements, such as the trades. . . . Practically all the communities discussed have survived isolation, in-breeding, and decimating diseases; but, with the exception of the Spanish population of Cuba and Puerto Rico, they cannot stand against the diseases and economic standards of the negro and are being gradually absorbed. In some instances governmental action might break the vicious circle of disease and poverty and elevate the whites, as the Dutch have done in St. Martin, but it seems that nothing can ultimately prevent the complete absorption of these numerically inferior groups. This being so, no white government should direct emigration to the Caribbean, which clearly is destined to become a negro region."

In the arid and wet-dry regions of tropical Australia settlement seems to have failed in the west. But in the Northern Territory males can at least survive "and maintain fair standards in the face of isolation and other difficulties provided they abstain from alcoholic excesses and engage in hard manual work." The Australian should be advised to regard these districts as suitable for pastoral and mining pursuits, but not for dense settlement.

In the New World Costa Rica offers some interesting lessons to the student

of white settlement. Hitherto the republic has escaped negroidation. The educational standards are high: "Costa Ricans to-day may be justly proud in having more school teachers than soldiers." But unless some strict control is exercised over the lines of communication between the coasts and the plateaus there is the risk of ultimate negroidation even here.

In South America "poor health and lack of comfort in the lowlands and isolation in the highlands present almost insurmountable obstacles."

American successes at Panama have been so remarkable that it is only to be expected that a good deal of space should be devoted to this region. The presence of the canal of course puts this particular settlement in a unique position from the economic point of view, and this in turn has encouraged the Americans to spend a good deal of money on the region which used to be one of the worst in the world for disease, malaria and yellow fever being the outstanding scourges. But research and modern methods of sanitation have altered all that. "American methods at Panama put British Indian, British Malayan, and north Australian sanitation (or lack of sanitation) to shame. . . . Very modern, too, and very sensible are American modes of dress. One sees neither heavy helmets nor shirts reinforced against sunstroke. The dress of men, women, and children is light and airy in the extreme. . . ." Even so the danger of absorption by the native population looms in the background, for scientific medicine is doing as much to increase the coloured peoples as the whites.

In Africa Europeans rule for the most part as sojourners. But even on the plateaus of British East and Central Africa where more permanent settlement seems possible, it is likely that the negro population will eventually undercut and absorb the white.

The third and last part of the book examines point by point the more important factors which influence white settlement in the tropics. These are divided into three groups: those concerning the qualities of the immigrant peoples, the environment they encounter, and external influences (economic, political, etc.). With regard to race we seem to be ignorant of why certain ethnic mixtures are satisfactory in the tropics and others are not. There is need for further research. As far as environment is concerned, it seems clear that isolation, particularly in the presence of ethnic groups in a lower stage of development, retards progress. Study of the nature of tropical soils is important and hitherto has not received adequate attention. Certain types of tropical climate seem to be more suitable for the white man than others, and an attempt is made to analyse the special features of the favourable ones. In addition to health, diet, clothing, exercise, and acclimatization all come under review.

The main task of the author of this book has been to emphasize the vastness of the subject and its complexity. He has shown how much effort can be wasted unless the problem is tackled in the correct scientific manner. In thus making clear the issues he has contributed much to our understanding of the subject. The book is of interest to the general reader, but it will appeal especially to the student of colonial problems and to those who trade or work in tropical lands. There are a number of maps to illustrate the points made in the text, and a few well-chosen photographs. All the notes to the various chapters are collected together at the end of the book; they contain many references to the literature and several quotations from important works. Appendices on the physiology of acclimatization to tropical climates, comfort zones and acclimatization, and cooling power are included. Perhaps the appendix on physiology attempts to explain too much in a short space; it might have been better to have given useful references to the subject and left it at that. The small type used for the notes and appendices makes reading trying. C. B. W.

REVIEWS

EUROPE

LONDON'S OVERGROWTH, and the causes of swollen towns. By S. VERE PEARSON. *London: The C. W. Daniel Co.*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 192 *pages; illustrations and plans.* 8*s* 6*d*

This book, whose author is a medical man, shows that planning alone cannot solve the difficulties caused by the growth of London. The author sums up his inquiry by stating, "Recognition and establishment of the sovereign rights of the people, resulting in their disentanglement from their usurpation by individuals, is, in a nutshell, the remedy for London's overgrowth." This is followed by a fourteen-point "declaration of the rights of man," some of which set forth the author's condemnation of the existing rent system. He gets rid of financial difficulties largely by the simple expedient of the eleventh point, which states, "No legislative enactments of the past that are contrary to the natural law of simple justice can be regarded by the living as valid; if there are any such, they should be ignored or repealed."

But the problems of London's growth are not so easy of solution as this, and history is not usually disregarded—at least in this country. Nevertheless, the book is a valuable contribution to the literature of the problems of urban growth, for the facts are fully stated and illustrated by a wealth of useful extracts from books and official and other reports, from evidence before Royal Commissions, and from reports of conferences. In general, the facts of the many aspects of the problem are well stated, but their interpretation is not always accurate and sometimes the more important are not distinguished from the less important. The book should be read by all interested in the growth of capital cities. L. B.

EAST ANGLIA. By DOREEN WALLACE. ("The face of Britain" series.) *London: B. T. Batsford*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii + 120 *pages; illustrations and location-map.* 8*s* 6*d*

This book covers an area somewhat larger than that recognized by geographers as East Anglia; according to the publishers its scope is "everything east of the Great North Road, about as far north as Boston." The author for some years has lived in Suffolk, almost in the centre of the area she has so charmingly described. She is enthusiastic about the subtle charm of the various types of the East Anglian landscape, and aptly describes the beauties of the woodland and skies which were the source of inspiration of the famous East Anglian painters. Miss Wallace frankly states that she has selected topics which interest her personally, and throughout the whole of her work she gives her own candid opinion with a certain amount of vigour. The first part of her book is concerned with farming. She shows that, both by tradition and climate, East Anglia is essentially an arable area. She deals at some length with the economic difficulties of the present day and refers to the pioneer work done by Townshend, Coke, and Arthur Young. Architecture, the character of the people, East Anglian dialect, the flora and fauna of the whole area are treated as general topics rather than scientific subjects.

The author divides the district into five regions: the fair-to-good farming land, the Fens, Breckland, the Broads, and the coast. Throughout her description of each region the chief points of the towns and villages which attracted her notice are vividly portrayed. With regard to the extent of each of these regions Miss Wallace follows her own choice: for example she includes the

greater part of the Good Sand area and even Newmarket under the heading of Breckland. The section on the Broads is somewhat brief, and her southern boundary, the Norwich–Yarmouth road, should have been placed farther south to include the lower Yare and the small broads of Rockland and Surlingham. The reviewer would not agree with her "that one [broad] is very like another"; each has its individual characteristics. The book contains many delightful and amusing paragraphs, and it is admirably illustrated.

J. E. G. M.

FROM LAND'S END TO JOHN O' GROATS. By COLIN HOWARD. *London: Blackie and Son*, 1939. 8×5½ *inches;* x+308 *pages; illustrations* (*by Margaret Holman*). 8*s* 6*d*

This is a sprightly record of a tour in an old car carried through in fourteen days. The route was by Bodmin, Gloucester, Shrewsbury, Chester, Carlisle, Inverness, and Wick. The topographic feast is seasoned by a liberal helping of humanity. Perhaps not an ideal guide, as a book of touring adventure it makes excellent reading: one would like to have a jaunt with so alert and witty a traveller. There is many a good laugh to be had with him, *e.g.* in the Pump Room at Bath, at the drinking trough at Newent, on Ebbistock Bridge, apple gathering at Wigan, or meeting a Gloucesterman at Crieff; and readers will be as sorry as he was when John o' Groats is reached. Perhaps he will revise his explanations of the name Morthoe and of Wiveliscombe, offered, one thinks, with tongue in cheek.

S. E. W.

THE VERGE OF SCOTLAND. By WILLIAM T. PALMER. *London: Robert Hale*, 1939. 8½×5½ *inches;* 284 *pages; illustrations and sketch-map.* 10*s* 6*d*

THE LOWLANDS OF SCOTLAND. By GEORGE SCOTT-MONCRIEFF. ("The face of Britain" series.) *London: B. T. Batsford*, 1939. 8½×5½ *inches;* viii +120 *pages; illustration and location-map.* 8*s* 6*d*

THE ISLANDS OF SCOTLAND: Hebrides, Orkneys and Shetlands. By HUGH MACDIARMID. *London: B. T. Batsford*, 1939. 9×6 *inches;* xx+140 *pages; illustrations and sketch-map.* 10*s* 6*d*

SCOTLAND UNDER TRUST. The story of the National Trust for Scotland and its properties. By ROBERT HURD. *London: Adam and Charles Black*, 1939. 8½×6 *inches;* xx+106 *pages; illustrations and location-map.* 6*s*

While none of these books is in the strict sense of the word geographical, each has an interest of its own for the geographer. Each of the last three, moreover, has been influenced by the Scottish National movement, and on that account also they are not unworthy of consideration at the present time. Mr. Palmer deals with the Border lands between the Yarrow–Tweed and the Tyne. He knows his country well, and even if there is a certain lack of discrimination in the choice of material, the book is readable throughout. There are many good descriptions of scenery, much interesting information about plants and animals and the habits and occupations of the people, and an abundance of anecdote gleaned from the lighter side of history. The book ought to prove a good companion to visitors to the Border country.

Mr. Scott-Moncrieff describes not only the central lowland but also the north-eastern lowland from Aberdeen to Inverness. Although he is concerned mainly with human affairs there are many descriptive sketches which show a real appreciation of the scenery of the country. In his treatment of other subjects, ecclesiastical, architectural, economic, and political, the author tends to be too sweeping in some of his judgments, and the solutions of the problems he raises are not always as simple as he appears to think. But at any rate he is correct in his assumption that under modern conditions Scotland tends to

purchase from England much that she could produce for herself. He also describes effectively the evils arising from the over-centralization of industry, as in the Glasgow area. The work is illustrated by many beautiful photographs.

Mr. MacDiarmid has made his home in the Shetlands and his chapter on these islands is the most interesting in a by no means uninteresting book. He describes vividly and sympathetically various aspects of the life and work of the inhabitants, and examines the reasons for the decrease of the population and the declining importance of the fishing industry. He compares the Shetlands with The Faeroes as these were eighty years ago and says that "the cultural and Home Rule movements in The Faroes have gone hand in hand with a notable economic regeneration, and it may be that in the Shetlands none of these can be achieved without the other two." As he indicates elsewhere, this would involve "a recovery of the old Norn tongue and an effort to build up a vigorous cultural movement on that basis." Of such a reorientation of the life of the people he sees no sign at present. The book contains a number of excellent photographs, especially of bird life.

'Scotland under Trust' differs from the preceding books. In it the author tells the story of the National Trust for Scotland and the properties which it now controls. The Trust, which was founded but eight years ago, has already done notable work. It has acquired Glencoe and a considerable stretch of highland country in its neighbourhood; it owns part of the field of Bannockburn; it has undertaken the restoration and preservation of Culross; and it has saved from destruction various houses of historical interest throughout the country. These varied activities, and the reasons which inspired them, are pleasantly told in this book.

But is it not surprising that three books, all tinged with Scottish nationalism, should be published in London? J. McF.

MODERN SWEDEN, as seen by an Englishwoman. By CICELY HAMILTON. *London: J. M. Dent and Sons*, 1939. $7\frac{1}{2} \times 5$ *inches;* xii+226 *pages; illustrations.* 7*s* 6*d*

The contents of this popular book on modern Sweden, like the surveys by the same author of other European countries, are guided by those features of the national life which are of particular interest to British readers at the present time. Thus the volume on Sweden, very refreshingly, does not give much attention to armies, police forces, labour services, and social upheaval. Instead we find chapters on such topics as housing, schools, recreations and gymnastics, parliament, royalty, and the Nobel Prizes. The happy picture painted of Sweden is not forced. Miss Hamilton describes what she has seen and been told in an attractively objective manner, and there are some small features of Swedish life which neither author nor reader finds entirely satisfactory. The interesting chapter on alcohol tells of the necessity of introducing the present cumbrous liquor regulations.

Chapters on forestry and on the iron industry are interesting to the geographically minded, though they do not contain much that is not generally known. The chapters on housing, describing some of the social implications of a number of housing societies of different types, would be to many the most illuminating in the book. The activities of the "Own Homes" movement sponsored by the Stockholm municipality, and the activities of "H.S.B." (Tenants' Savings Bank and Building Society) are fully discussed. The H.S.B. flats, first appearing in Stockholm in 1923, are now a familiar feature in several other of the larger Swedish towns.

Miss Hamilton allows herself a number of interesting digressions in which

she compares Swedish activities and customs with their counterparts elsewhere One may however doubt the soundness of some of her remarks on English teachers such as occur in the footnote on pp. 97–98. F. H. W. G.

ASIA

THE GOLDEN MILESTONE: reminiscences of pioneer days fifty years ago in Arabia. By SAMUEL M. ZWEMER and JAMES CANTINE. *New York: Fleming H. Revell Company*, 1938. $8^1/_2 \times 5$ *inches;* 157 *pages;* 15 *illustrations and sketch-map.* $1.50

This entertaining little book tells the story of the inception of the American Mission to Arabia, its pioneer days, and something of the later part of its first fifty years. As remarked in the introduction, "the names of great explorers are usually emblazoned across the pages of history. Not so with the missionary," who so often follows closely on the explorer, and with whom exploration is a sideline. But the pioneer missionary may become a legendary figure in his own region, and the names of the two authors are now part of the Arabian legend, at any rate in the southern and eastern fringes of the vast peninsula. From the time this Mission originated in 1889 down to 1939, eighty of its missionaries have gone to Arabia, seven hospitals have been opened, and hundreds of Arab children have gone through the schools. The decline of fanaticism among the Arabs in recent years has been noteworthy.

Of the many events lightly touched on, some are humorous and some tragic, but all are interesting. Dr. Zwemer relates exciting encounters with tribesmen in a voyage along the south coast in 1891, when British jurisdiction east of Aden still ended far short of Mukalla. After work had been started in Basra the same writer made a 700-mile tour of Mesopotamia in July and August 1892—needless to say, with none of the modern methods of alleviating the summer heat; we see him among Shi'ahs at Samawa during the Moharram festival, meeting Mandaeans at Nasiriya, and among the Ma'dan or water-Arab pirates. Dr. Cantine expresses his unqualified admiration of Sir Percy Cox and his wife, whose "boundless hospitality" he first experienced during a period of eight years' work in Muscat, beginning in 1898. A station was first opened at Bahrain in 1892, ten years later a hospital had been built there and among the patients was the son of an Arab who had befriended Doughty. Incidentally the building of this hospital was the means of introducing windmill-pumps to the Bahrain islands. Dr. Zwemer, who in 1893 rode from 'Ojair ('Oqair), on the mainland near Bahrain, to Hofuf in Hasa, writes of the "fountains and streams and fields of rice and swamps—everything so unlike Arabia of the school geography"—in the Hofuf oasis. He also made two visits to San'a, in 1891 and 1894, just before and after W. B. Harris's "Journey through the Yemen." These journeys were attended by much difficulty and obstruction. The present writer, having found conditions in Yemen not entirely different in 1937–38, can sympathize with Dr. Zwemer. The varied and excellent photographs lend additional interest to the book. H. S.

THE READJUSTMENT OF THE INDIAN TRIANGULATION. By Major G. BOMFORD, R.E. Professional Paper No. 28 of the Survey of India. *Dehra Dun: Geodetic Branch Office*, 1939. 11×7 *inches;* viii+110 *pages; maps and figures.* 7*s* 6*d*

The first adjustment of the Indian triangulation was completed in 1880. It was based on the method of least squares, but in order to render the computations manageable the Peninsula was divided into five sections. The nature of this

division can best be grasped by imagining the southern tip as cut off by a line at about the latitude of Hyderabad. The remainder of India proper was then quartered, so that it may be considered in terms of the usual four quadrants. Now, unfortunately, whilst the second and fourth quadrants were "gridded" with primary triangulation, the first and third quadrants contain series of chains of a lower order of accuracy. The first quadrant, known as the N.E. Quadrilateral, occupies the Gangetic plain between the meridians of Gwalior and Calcutta; the third quadrant, the S.W. Quadrilateral, occupies apparently the major portion of the Bombay Presidency. The centre of this quartering is in the vicinity of Kalianpur, the Indian Geodetic Datum, on the great Indian Arcs of Meridian and Parallel.

The severance of the main triangulation into two quadrants, together with the southern tip, has thus been necessitated by the existence of these two big blocks of secondary work. It bears such an awkward configuration for adjustment—though fortunately Kalianpur is at the point of junction of the almost discontiguous sectors—that it has very naturally been considered advisable to include one of the north–south secondary series of the third quadrant, that between Deesa and Poona, in the primary adjustment. No such borrowing has been made from the N.E. Quadrilateral.

Adjustment by least squares of the N.W. and S.E. Quadrilaterals and the Southern Trigon in one operation would involve 113 conditions and about 2740 unknowns. It is not surprising that such a formidable undertaking was not faced, though it may be questioned if it could not be effected to the necessary degree by the Southwell method of "relaxation." If the major errors could be removed in this way, the minor might well be left for local dispersal. This in any case was not the method pursued; Major Bomford decided on trying common sense and simplicity. The procedure was as follows.

The original figural adjustments, founded on least squares, were applied along selected routes, right and left as regarded outwards from the origin, in order to give preliminary values of scale, azimuth, latitudes, and longitudes. The two routes of course show discrepancies at junction and circuit points, so that the next part of the process is the dispersal of these discordances. The errors of scale at base-lines and circuit closures were therefore distributed after an assessment of the probable relative strengths of the component chains. The latitudes and longitudes were then recomputed on this preliminary adjustment. The new misclosures in latitude and longitude of all junction points should be improved; actually they are considerably lessened at nine points and considerably increased at three, whilst at twenty points the changes are evenly divided between small decreases and small increases.

The next stage involved the removal by trial and error of these new discrepancies in latitude and longitude. This involved changes of scale and azimuth; but actually, as the author points out, there was not a great range of choice in the process. The difficulty here lies in the dispersal of the larger discrepancies; geodetic surveyors have often discovered that compulsory removal of these major discords throws a strain on the triangulation greater than it should bear, particularly of course in short chains. The effect might be to introduce changes in the measured angles perhaps much greater than even an extravagant estimate of angular error would permit. Hence the dispersal of the major misclosures in particular must be effected in such a manner as to keep the strain as small as possible.

In this way the scale, azimuth, latitude, and longitude at all junction points were finally fixed. And nothing beyond slide-rule working was entailed in the processes. The subsequent recomputation of the whole of the Indian triangula-

tion can be carried out at any convenient time, since it involves a hundred com pletely independent areas of work.

Assam and Burma have not been considered above ; since the connection with India is weak, the results reached are regarded as merely provisional. The existing published values for all India are set out in some 500 "Triangulation Pamphlets"; the corrections consequent on this readjustment are indicated for a few areas in the following table, derived from Plate VII.

Unit 0·01 *second of arc*

Area	*Gilgit region*	*Iran frontier*	*Cape Comorin*	*Calcutta*	*Mandalay*	*Packhan Tenas-serim*
In latitude ..	−30	−30	00	+10	+60	+ 40
In longitude	−20	−10	+90	−15	+25	+220

A very interesting series of comparisons between the estimated and actual errors of the adjusted triangulation is shown. The means are exhibited here.

	Base-line closures (in log)	*Laplace azimuth closures*	*Circuit closures Scale (in log)*	*Azimuth*	*Position (feet)*
No. of comparisons	21	39	31	31	32
Estimated error ..	50	1″·15	65	1″·76	19
Actual error ..	47	2″·27	63	3″·51	26

For the reproduction of one base on another and for the scale at circuit points the differences are those of seven-figure logarithms; it is seen that the errors have been estimated with remarkable nicety. The corresponding errors of position differ by no more than 35 per cent. The azimuth errors, on the other hand, were underestimated: the actual are in the mean twice the estimated. Moreover the Laplace azimuths, though they are 33 per cent. less than the general circuit azimuths, do not make too good a showing. The figures confirm the view that in triangulation growth of azimuth error is greatly to be feared, even when azimuths are adjusted by the Laplace Equation.

The author states that, except in a few isolated places, the error of the scale of the adjusted primary series is very unlikely to exceed 1/72,000, which seems very probable in view of the average closure between bases, namely, 1/94,000, remarkably similar to the South African mean of 1/100,000. He concludes also that under the same conditions the adjusted azimuth is likely to be correct to 2″·5. For the Peninsula as a whole he holds that distances may be taken as correct to 1/500,000, errors in individual series doubtless neutralizing one another in large measure.

This review can obviously cover no more than a limited number of salient facts: geodesists will find in the Professional Paper itself an immense amount of food for thought. Even on the basis of the author's statement that the simplest methods were adopted, he and his computers have obviously accomplished a great undertaking. The plates are excellent, exhibiting at a glance the results of the work. G. T. M.

EASTERN VISAS. By AUDREY HARRIS. *London: Collins*, 1939. 9 × 5½ *inches; 392 pages; illustrations and route-map.* 12*s* 6*d*

Readers of this book will regard Miss Harris as most fortunate in having had the opportunity of so extensive a journey in Asia. They will also consider that it was fortunate that it was Miss Harris who made the journey, for she describes

it remarkably well. This indeed constitutes the only value of the book in a geographical sense, since Miss Harris went nowhere which has not often been visited before.

Miss Harris's first stage was by the Trans-Siberian Railway to Harbin. She was properly impressed by the cleanliness of Japanese habits and by the efficiency with which Korea is run. To lack a sense of humour is perhaps part of the Japanese burden, and Miss Harris suffered from this on several occasions. A short walking tour in Korea gave her an opportunity of appreciating the Japanese taste in holidays, but in Japan itself she was conscious of a general sense of frustration, and attributes to this the relatively high incidence of both suicide and insanity.

China impressed Miss Harris very forcibly, and thereafter reference is made to that country for a standard of comparison. Nothing could conjure the country more clearly than her observation that the sounds of Pekin are made up of "shouting, talking, wakeful humanity," so different from the mechanical clatter with which Europe reverberates. In her view the West has much to learn from China, "not in justice, drains and mechanics, but the great art of living, culture of mind, patience and courtesy—true civilization." Miss Harris managed to reach Jehol despite the representations of the British authorities. She was given gruesome accounts of Japanese activities in the occupied areas of China by many missionaries. Miss Harris betrays an uncritical attitude of mind when she describes the Chinese Communists as "Reds"; this view is no longer in accordance with the facts. Miss Harris finally stepped off China into a junk—"a melody seemed broken, never finished for those who have begun to hear it."

Miss Harris's attitude to India is clear from the fact that she used her topee as a plum-basket. She wasted little time in making her way to the borderlands of the Himalaya, Nepal, and Sikkim. In the latter she spent four months, and describes life there with sympathy and understanding. In her description of the various races in Afghanistan Miss Harris has not understood the origin of the Hazaras, and a summary of Afghan history without mention of Nadir Shah or Mahmud of Ghazni is scarcely complete. Nothing however could better describe Afghan buses than to compare them with "battered tea caddies." Her journey through the Hindu Kush with a German doctor included the disappearance of their car backwards over a cliff. To cross the Oxus seemed like going back to Europe, and this view was perhaps justified since she could not descend at either Samarkhand or Bukhara. Incidentally, Miss Harris was gravely misinformed by those who had told her that these two places no longer justify a visit.

The book is amply illustrated, and one picture of Ghazni is remarkably beautiful. In a second edition a proper map and an index might well be added.

B. M.

AFRICA

LE MAROC, chez les auteurs anglais du xvi^{e} au xix^{e} siècle. By ROLAND LEBEL. *Paris: Larose*, 1939. $7\frac{1}{2} \times 4\frac{1}{2}$ *inches;* 162 *pages.* 20 *fr.*

This quite important and attractive little book gives an account of English writings on Morocco, and a critical appreciation of their significance as contributions to the general and literary history of the period surveyed and to the knowledge, in England, of Morocco and the Moors. The author, who has had recourse to the invaluable 'Sources inédites de l'histoire du Maroc,' by De Castries, and to the great 'Bibliography of Morocco,' by Playfair and Brown, has given a surprisingly comprehensive survey for so small a book. Without

overlooking the one or two literary references in English to Morocco before the sixteenth century, the author first examines the period of Elizabeth and James I, outlining the literary outcome of early commercial and political relations between England and Morocco. The contributions of the first travellers led to the beginning of a Morocco mode in the exoticism of the period, which is noticeable in several of Shakespeare's plays, for example. The literary results of the English occupation of Tangier between 1661 and 1684, during which time Pepys visited Morocco, were very dull. The seventeenth and eighteenth century period of piracy, and of enslavement of many European, including English, captives in Morocco, gave rise to a considerable output of accounts of their experiences by ransomed and escaped captives, including that by Pellow. These influenced the literary taste of the period considerably, and were a contributory cause of the development of fiction based on actual events and with correctly portrayed local settings, of which Defoe's 'Robinson Crusoe,' with some of its setting in Morocco, is an example. The late eighteenth and nineteenth centuries witnessed the production of the first good documentary works, including those of Lemprière, Harris, and Budgett Meakin, and the first accounts by tourists.

The work is far from being a dull catalogue, and by its excellent style, clear arrangement, and the curious range and interest of its matter will provide fascinating reading to all interested in English literary developments in general, and to those specially interested in the historical links between Morocco and England. There is a good index of authors mentioned in the text. W. Fg.

DIE FASCHISTISCHE KOLONISATION IN NORDAFRIKA. By Oskar Schmieder and Herbert Wilhelmy. *Leipzig: Quelle and Meyer*, 1939. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* viii + 204 *pages; illustrations, maps, and plans. M.*6.80

It is interesting to have this clear statement of German views on the colonization of North Africa. Libya is definitely only an instalment; "so poor a region (*Raum*) could in no wise satisfy the striving for colonial possessions of so great a people." East Libya however is a bastion pushed out into the Mediterranean from which Egypt and the rest of the Orient can be threatened. A map shows that the two great sections of the Italian African Empire are separated only by the strip including Egypt and the Anglo-Egyptian Sudan.

The authors state that the colonization of Libya was simplified by the fact that the native population was sparse, and lacking in homogeneity and in unity. But the Italians have recognized that in Africa they can rule only so long as they are strong: no other colonizing power has adopted this principle so uncompromisingly, and pursued the consequent policy so successfully. Fascism requires a sharp line to be drawn between native and Italian, thus avoiding the "British" methods of "deifying" officials who have nothing to do with the natives, and the French method based on ideas of the equality of men. The British and French, we are told, can deal with Arab aspirations only with the sword; the Fascist method is more human.

A good historical account of the region is given, and there are considerable details of the present-day settlements, though few figures as to expenditure are given, and those do not agree with some of the published Italian figures. The book is of interest mainly as an expression of the German point of view, and its clear statements are illuminating. E. J. R.

L'EXPLORATION DU SAHARA. By Henri-Paul Eydoux. (La découverte du monde. Edited by Raymond Burgard.) *Paris: Gallimard*, 1938. $8 \times 5\frac{1}{2}$ *inches;* 242 *pages; illustrations and sketch-map*

This attractive book presents in concise but very readable style the story of the modern development of our knowledge of the Sahara. Until the end of the

eighteenth century, descriptions by the classical Greek and Roman historians and geographers, with the later accounts by the medieval Arab travellers, formed the basis of what Europe knew about the world's greatest desert. But in 1798 a young German, Hornemann, succeeded in making the first known crossing by a European, and some thirty years later Major Laing, and after him René Caillié, crossed, the former from Tripoli to Timbuktu, the latter from Timbuktu to Morocco. These were the pioneers. But as the century wore on, great figures like Barth, Duveyrier, Rohlfs, and Nachtigal ranged over different parts of the Sahara and finally settled men's minds as to its main features. Later on, schemes for a trans-Saharan railway gave rise to several missions, including the tragic Flatters Expedition, and, among mystics who contributed, the Frenchman Père de Foucauld stands out. But by the end of the nineteenth century, journeys and exploration by pioneers finally gave place to political and military missions organized and financed by States, notably the Foureau-Lamy by the French. In the western Sahara the last great blank on the map disappeared only in 1936, and in the Libyan Desert in 1933. With pacification, completed by the French in the Moroccan Sahara in 1934, a new era of scientific exploration in detail has been opened. The book is well arranged, and is illustrated by a sketch-map showing the location of principal places mentioned in the text, and by photographic illustrations of places and of outstanding personalities. In addition it has a well-selected bibliography of major works. W. Fg.

NORTH AMERICA

THE CALIFORNIA DESERTS: a visitor's handbook. By Edmund C. Jaeger. (Second edition.) *Stanford University, California—London: Oxford University Press*, 1938 [*first published in* 1933]. 8×5½ *inches;* x+210 *pages; illustrations and maps.* 9*s*

This booklet was first reviewed in the *Journal* for September 1934. The appearance of a revised edition, though involving only minor changes in bringing it up to date, is sufficient excuse for drawing attention to what a scientist can do in the popular treatment of natural history. It is accurate, vivid, readable, and in perspective. I have found it to add greatly to the interest and value of several trips into the Great Basin, while to any one unacquainted with the locality it conveys a surprisingly true picture not only of the California hinterland but, by extension, of semi-desert regions in general. This is partly the result of the broad view taken by the writer and his ability to arrest even the casual reader by striking comments.

After noting that the term "desert" does not necessarily imply paucity of life, continuous heat, or presence of sandy wastes, he draws attention to the surprisingly large portion of the globe which is desert or semi-desert. As examples he offers the Mohave and Colorado deserts, briefly discussing first their geological history and structure, and then the humid ice-age conditions which preceded the present state of aridity, with its vanished lakes, salt and borax deposits, and torrential thunderstorms. Thanks to a few neat line-diagrams, physiographic features such as the lava flows, volcanic cones, salinas, and bolsons of the area are clearly explained; many useful ideas are insinuated regarding the geological processes of weathering, erosion, dune formation, development of desert varnish, ground-water action, and the like, combined with striking observations on related aspects of natural history. The short section on climate and weather ends with data on the rate of evaporation: 85–116 inches annually, in contrast with the Libyan maximum of 150 inches.

The remaining chapters of the volume deal with the wide variety of desert

life, including insects—when burning heat kills the adult springtails, their eggs live 271 days, while the lac-scale actually thrives in heat under the warty coverings of the resinous creosote bush—snails and other molluscs, fishes of the hot springs and briny lakes, reptiles, birds, and mammals (many drink no water from birth to death), cacti and other shrubs and flowering plants. A chapter on the Indian aborigines of the desert is added by Malcolm Rogers, and there is a useful postscript entitled Travel Hints, of special value as a guide to the localities and trails of peculiar interest. Four pages of carefully selected reference material list works, almost entirely American, on all immediately relevant aspects of natural science. The book is indexed, well bound, has two maps, and fits the pocket. It is a pity that there are not more publications of this calibre planned for the intelligent traveller and tourist. G. B. B.

A HISTORY OF THE CANADIAN WEST TO 1870–71. By ARTHUR S. MORTON. *London: Thomas Nelson and Sons*, [1939]. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xiv + 988 *pages; maps.* 25*s*

Fish, furs, and wheat mark broadly the stages of Canada's development. It is with the second of these that Professor A. S. Morton is largely concerned in this study of the Canadian West. Defining the West as "that part of Canada which lay north of Lower Canada that was, and north and west of Upper Canada," he traces its development from the earliest times to Confederation. In the seventeenth century the French were stationed on the St. Lawrence and the English on Hudson Bay, both competing for the valuable fur trade. Down to 1713 the conflict lay in the Bay itself, to which the Hudson's Bay Company was attempting to draw the trade, whilst the French sought to draw it southward to the St. Lawrence. When the French ceded Hudson Bay in 1713, the struggle shifted to the great fur forests in the hinterland of the Bay. The question of sovereignty was settled by the Treaty of Paris in 1763, but the commercial struggle went on, for the Hudson's Bay Company had to meet the competition of French and English fur traders from Montreal. It was this competition between the Company and the "Pedlars" that led to the building of inland posts by the former, who had hitherto relied on the Indians bringing the furs to the forts on the Bay. The "Pedlars" themselves united into companies which combined to form the great North West Company in 1804. This led to a long and violent struggle between the Hudson's Bay Company and the North West Company, which only ended with their union in 1821. In the course of this struggle trading posts were extended to the foothills of the Rocky Mountains and the Hudson's Bay Company undertook a reorganization of which Professor Morton considers the foundation of the Red River Settlement an integral part. He shows that the Settlement was meant to supply cheap provisions and a reservoir of labour, which would strengthen the Hudson's Bay Company in its struggle with the North West Company. This is different from, and more intelligible than, the traditional view which sees in the Settlement an isolated example of early western colonization. It is interesting, in this connection, to compare the author's account of the foundation of Selkirk's colony with that, for example, of Mr. L. J. Burpee in volume V of the 'Cambridge History of the British Empire.' The union of the companies in 1821 was followed by a period of calm and prosperity in the fur trade. The union also facilitated the opening up of the Pacific West. That in turn brought difficulties with the United States, which materially strengthened the idea of a Confederation into which the Red River Settlement entered in 1870 as the Province of Manitoba; British Columbia followed in 1871.

It is impossible even to enumerate all the topics dealt with in this monu-

mental volume. The organization of the fur trade, the journeys of exploration, with special emphasis on La Vérendrye's work, and the boundary disputes with the United States all receive full treatment. The whole work is based on primary sources, especially the rich archives of the Hudson's Bay Company. A bibliographical appendix shows the wealth of this material, but perhaps it scarcely compensates for the absence of bibliographical footnotes. These may plague the reader, but they are indispensable for the scholar. These sources have been made the basis of a narrative which is not impaired by the exhaustiveness of the treatment; nor does the variety of subjects covered break up the unity of this study. Professor Morton has combined vast knowledge of his material with an equally deep knowledge of the land and its people to produce what must become the standard history of the Canadian West before Confederation.

T. S. W.

DESERTS. By GAYLE PICKWELL. *London: McGraw-Hill*, 1939. 12×9 *inches;* xiv+174 *pages; illustrations and sketch-map.* 15*s*

This is essentially a book of pictures. It contains sixty-three large photographs taken in the true deserts of the United States, those that occur in California and Arizona. Some illustrate geographical features, such as sandy wastes, rippled surfaces, gravelly pavements, sheets of salt. Others show striking forms of vegetation, cacti, squaw cabbages, prickly poppies, and so on. Still others exhibit the animal inhabitants, mammals, birds, insects, but particularly lizards and snakes. Accompanying the pictures is a running commentary, which makes the whole rather like a lantern-lecture. There is in addition a brief account of desert problems; how, for instance, deserts come to be formed, how desert plants solve their water difficulties, how desert animals protect themselves in these exposed situations, and many other interesting points. But the chief thing in the book are the splendid photographs, which deserve high praise.

R. W. G. H.

THE CHINANTEC. Report on the central and south-eastern Chinantec region. Vol. I. The Chinantec and their habitat. By BERNARD BEVAN. (*México*): *Instituto Panamericano de Geografía e Historia* (*Publicación No.* 24), 1938. 10½×8½ *inches;* 162 *pages; illustrations and sketch-maps*

Because of the natural isolation in which the Chinantec people have been kept by the nature of their habitat, in the most mountainous district of Oaxaca, this is the first integral study on the subject to be published. Having explored the Chinantla from one end to the other, Mr. Bevan is able to tell us, in a vivid narrative and with much interesting detail, about the various characteristics of that almost unexplored and inaccessible territory, with its huge slopes and chasms, its rapid streams, its dense forest and multiplicity of natural products, and the constant rains. He illustrates the various ways in which this natural background has influenced the life of the people; how they have adapted themselves to their habitat in the constant struggle with the forest and climatic conditions; he describes the shape and the manner of building their houses, the suspended bridges, ingeniously made from reeds grown in the forest, their agricultural and other activities, their food and dress, and their communal customs.

Mr. Bevan devotes a special chapter to show the distribution of the Chinantecs over the Chinantla. He describes the peculiar way in which the head-towns grow and diminish to give place to new minor settlements, according to the agricultural needs, and how as a consequence the population is constantly on the move within its particular district. The study includes the social and

economic relations and contacts between the Chinantecs and the neighbouring groups: Zapotecs, Mijes, Mazatecs, and the Spanish-speaking population.

The accompanying tables of statistics show the racial and linguistic place occupied by the Chinantecs amongst the various groups of population of Mexico in general and of Oaxaca in particular. Very important for the knowledge of the Chinantec people are the observations on the great influence of the missionary work of the Dominican friars in the sixteenth and seventeenth centuries, of which clear evidence still exists. Of no less importance is the linguistic contribution in the form of vocabularies and documents in the Chinantec language, which the expedition was able to collect on the spot. The classification of the Chinantec language was difficult principally because of the lack of material. It is to be hoped now that a satisfactory study of it may be made.

Because of the quantity and quality of the information given by Mr. Bevan, and the sympathy with which he tries to understand and to expound the problems of Chinantec life, his book is a valuable contribution to the knowledge of that section of Mexican ethnology and geography. E. G.

AUSTRALASIA AND PACIFIC

AUSTRALIAN JOURNEY. By PAUL MCGUIRE. *London: Heinemann*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 396 *pages; illustrations and map.* 12*s* 6*d*

Mr. McGuire has, in the first place, written a very readable book, thanks to an attractive style and a sense of humour. Secondly, though he does not claim to make an original contribution to the study of Australian problems, he has summarized much information bearing upon the more pressing ones, and given them a reality and urgency by relating them to his own experiences. Born in Peterborough, S. Australia, of a family actively engaged in carrying forward the limits of settlement, he brings home the comparative recentness of much of the national development. He has also travelled throughout Australia and the outside world, and can thus look at her problems from a detached point of view. He writes interestingly of the growth of the great cities, of the Australian character, combining individual independence with a tendency to rely upon State action, of the settlement of tropical Queensland, and of the problem of water supply, over-stocking and soil erosion, among many other topics. He is particularly emphatic upon the necessity of restoring a proper balance between city and country life, a problem not peculiar to Australia. If at times he appears to hold rather pessimistic views as to the future, it is perhaps because his interests and feelings are closely engaged, and he is anxious to arouse his fellow-countrymen to action. G. R. C.

POLAR REGIONS

ARCTIC AND ANTARCTIC: the technique of polar travel. By COLIN BERTRAM. *Cambridge: W. Heffer and Sons*, 1939. $9\frac{1}{2} \times 6$ *inches;* xii + 126 *pages; illustrations and sketch-maps.* 7*s* 6*d*

Mr. Bertram deals with polar exploration from an angle from which it is often viewed and discussed by polar explorers, but from which it has seldom been presented to the reading public. He has endeavoured to relate the polar explorer, his methods, and his equipment (and his physical, mental, and spiritual experiences) to the environment in which he works and lives. It is only a slight study, but it has value as being the first of its kind. It is right that such a first study should be written by a young man still actively engaged in polar exploration. Nevertheless, one would be glad to see a complementary, and more

thorough, analysis written by an author who has first-hand knowledge of the old methods and ideas.

The reviewer in general agrees with the author's pronouncements on the comparative value, as polar draught animals, of dogs and men. Yet it would be interesting to see a day-to-day comparison between the length of journeys of, say, the Rymill and the McClintock sledge parties. The polar expedition should never be without dogs, and the British lost both Poles through lack of knowledge of how to treat and employ dogs and a consequent lack of faith in them. Nevertheless, under the varied conditions met with during almost any comprehensive sledging programme, covering a series of journeys in different directions over long distances, and through long periods of time, the records of manhauling parties compare surprisingly well with those of dog-drivers.

A single sentence from the book illustrates the great differences in conditions that prevail even along the edge of the Antarctic continent. Mr. Bertram writes: "Despite their wariness and speed, almost every seal bears upon its body at least one set of scars, the everlasting marks of great gashes inflicted by rows of pointed teeth that have barely been escaped." To any explorer of the Ross Sea area that would at first sight seem a strange statement: in the writer's three years of polar exploration he saw very few such scarred seals amongst the thousands encountered. The discrepancy however is just a measure of the difference in the conditions off the Victoria Land coast and those off Graham Land. The enclosed Ross Sea area is mainly inhabited by the slower and bulkier Weddell seal, which has evolved a shore-keeping, under-ice life that successfully counters the attacks of the killer whales. His cousin, the crab-eater, scurries from floe to floe there as elsewhere, and often escapes "by the skin of his teeth," and with the marks of the teeth on his skin. But he is the exception and not the rule among seals in the Ross Sea. This is only one interesting example of the way polar conditions vary from place to place. The Antarctic, again, is essentially as different from the Arctic as the temperate regions are from both. Mr. Bertram knows both. It is to be hoped that he will persevere in the exploration of the new literary field that he has opened up in this intriguing book. R. P.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

PHYSICAL AND DYNAMICAL METEOROLOGY. By DAVID BRUNT. Second edition. *Cambridge: University Press*, 1939 (*first published in* 1934). $10\frac{1}{2} \times 7$ *inches;* xxii + 428 *pages; maps and diagrams.* 25*s*

This is a specialized book, but the province of geographers includes the whole earth, and the processes of weather are not the least important of terrestrial phenomena. Descriptive climatology has long been a recognized part of geography, but the brief references in text-books to the physical side of meteorology are often crude or obsolete. Professor Brunt's authoritative book leaves no excuse for this to continue.

The first chapter is geographical: "a sketch of the surface distribution of the meteorological elements over the globe," illustrated by world maps for January and July of average temperature, pressure, and winds, and by diagrams of the vertical distribution and of changes throughout the day. This is the text which the remainder of the book sets out to elucidate. Next follow a few fundamental facts and relationships, mostly concerned with the behaviour of air under changing pressure and including a paragraph on barometric altimetry. This and the following chapters on water vapour and thermodynamics are matter for specialists in meteorology, but chapters 5 and 6, which deal with solar radiation and its transformations in the atmosphere, certainly come within the scope of

the geographer. The variation of solar heat with latitude is one of the fundamental facts for all sciences dealing with the earth, and Brunt sets out a difficult subject clearly and logically. We have travelled a long way from the simple conceptions of the "torrid" and "frigid" zones to the heat balance of the atmosphere.

Chapters 8–13 deal with wind, beginning with the general equations of motion and proceeding through the relations between wind and isobars to the surfaces of discontinuity or fronts which are so important in modern weather forecasting; here the treatment is highly analytical. Another aspect of wind which has come to the fore very much in recent years is turbulence, which is responsible for the succession of gusts and lulls characteristic of day-time winds. With the growth of travel by air, turbulence and "bumpiness" have become matters of everyday concern, and we may expect to find regions of excessive turbulence delineated on some future topographical chart of the air.

Another aspect of aerial geography is contained in the idea of air masses, the great currents of the atmosphere which—in our latitudes—come and go with the changing succession of "cyclic circulations" or depressions and anticyclones, but which in other parts of the world may be as regular as the currents of ocean. The fluctuating boundary between the great air masses of high and low latitudes, the polar front, is a conception of outstanding importance to geography as well as to meteorology. By way of contrast chapter 18 deals with anticyclones, islands of comparative stability all too fleeting in our troubled air but of fundamental importance in the economy of subtropical regions. So we come at last to the general circulation of the atmosphere, a synthesis presenting many unsolved problems but yet sufficiently understood to provide at least the structural basis for a physical geography of the air.

The book is difficult reading—many parts of it are impossible without an adequate mathematical equipment—but it deals with fundamentals which cannot be ignored. C. E. P. B.

PALAEOZOIC FORMATIONS IN THE LIGHT OF THE PULSATION Theory. By AMADEUS W. GRABAU. Vol. IV. Ordovician pulsation. Pt. i. . . . Caledonian geosyncline . . . *Peking: Henri Vetch*, 1938. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xxxiv+942 *pages; maps and diagrams*

In the present volume Professor Grabau further develops his theory of rhythmic geosynclinal sedimentation, bringing to bear an encyclopaedic knowledge, and fitting each stratigraphical fact ingeniously into its proper place. Fourteen times in the Palaeozoic system the pattern is repeated, and some idea of its complexity may be gathered from the fact that so far only six of these pulsations have been described in over 3000 pages. The Pulsation Theory seeks to explain the phenomena of transgression and regression in terms of periodic rise and fall of the sea-level, due to alternate swelling and contraction of the sea-bottom, and it will thus commend itself to the advocates of eustasy. The progressive overlap of strata is interpreted as pointing to simultaneous transgressions of the sea in all the geosynclines, followed by a simultaneous retreat as shown by the off-laps. These are followed by interpulsation phenomena including volcanic activity, orogenesis, erosion, and the accumulation of interpulsation continental deposits.

The geosynclines are considered to have been submarginal to a "Pangaea" with a South Pole somewhere in North Africa. They opened seaward into "marginal seas" which were the centres of faunal evolution, whence the organisms migrated with the transgressing waters into the geosynclines; conversely, with retreating seas a progressive narrowing of habitat led to extinction

of species and the survival of only a selected fauna which, during the transgression of the next pulsation period, expanded into the new faunal assemblage. The recognition of the phenomena of pulsation provides a new basis for the subdivision of geological time, and though, if established, it would result in an increase in the number of periods requiring recognition, it would present a more normal and orderly view of the progress of earth evolution. Such a revision would be very welcome, for the accepted stratigraphical record contains many artificialities resulting from the historical growth of the science and the piecemeal sampling of often abnormal and unrepresentative areas.

The idea of cycles of deposition and diastrophism is not new, but its application on a world-wide scale and with a eustatic basis is a bold claim, which can hardly be expected to find immediate acceptance. Professor Grabau is doing for stratigraphy what Wegener and Joly have done for structural geology; his theory, like theirs, provides a single simple clue to an enormously complicated subject. It demands the fullest consideration before acceptance; meanwhile geologists are deeply indebted to him for the careful compilation and collation of an imposing mass of stratigraphical information which he assembles as evidence of his theory. A. A. M.

GENERAL

ADDITION AND SUBTRACTION LOGARITHMS WITH SIX decimals. By Dr. B. COHN. (Second Edition.) *London: Scientific Computing Service, Ltd.*, 1939. $9\frac{1}{2} \times 6$ *inches;* 63 *pages.* 10*s*

Nowadays the best way of obtaining latitude and longitude with a theodolite is the quadrantal and intercept method. This method involves calculating an altitude and azimuth for each star observed, a somewhat tedious process by the usual formulae adopted for logarithmic computation. For observers requiring an accuracy sufficient for navigation purposes there are various tables for shortening the calculation, but none of these is suitable for field astronomy. To supply this need the Scientific Computing Service, Ltd., have kindly published a new edition of Cohn's Addition and Subtraction logarithms, largely to assist this Society's Form No. 7.

The purpose of these tables is to obtain the logarithm of the sum or difference of two numbers that are known by their logarithms only, and this they do with one table entry only, as against three required for ordinary logarithms. For ease in use it is well to have an arrangement of the calculations showing the order of working and procedure in all cases; this is given in the preface and, in a simplified manner, on R.G.S. Form No. 7. G. C. F.

MEMORANDUM ON THE TEACHING OF GEOGRAPHY. Issued by the Incorporated Association of Assistant Masters in Secondary Schools. (Second Edition.) *London: George Philip and Son*, 1939 (*first published in* 1935). $7\frac{1}{2} \times 5$ *inches;* xx+532 *pages; illustrations and maps.* 8*s* 6*d*

The second edition of this book is very welcome, for it has proved most valuable to all geography teachers in secondary schools. Considerable revision has taken place, and much new material has been added. In recent years the improvement of the position of geography in school and the advances in pedagogical thought with regard to the subject have been so rapid that the many changes in the new edition were more than justified. As it stands the book is full of excellent detailed suggestions of a practical nature, immensely valuable to all young teachers. It deals with all aspects of a teacher's life in the school, and does not shirk helping those with difficult working conditions. Four new features need special commendation: the bibliography; the appendix dealing with geography

teaching on the Continent; the reference to the Ship Adoption Society; and the study of local geography.

Wherever the authors have concerned themselves with practical hints, or dealt with aids to teaching, or written on sixth-form work, examinations or training of teachers, there can be nothing but praise; on the other hand, there is likely to be criticism of some contradictions that exist between chapters on the philosophy of the subject and those dealing with actual teaching methods. No doubt much of the difficulty is due to the fact that the book is a collaborative effort, but the over-emphasis on examinations suggests that the teachers have not yet thrown off all the old shackles. The book gives little emphasis to the need for variety in teaching; nor does it give any suggestions for experiment or inquiry into teaching method. No subject has greater need of pedagogical research and experiment.

One is constantly reminded that the study of men in their environment is the core of the subject. Emphasis is laid on the human aspect and on regional geography. Generalizations at an early stage are decried; physical, economic, and historical geography are said to be out of place except as incidental lessons; "determinism" is universally discredited. On the other hand, one finds such statements as the following: ". . . encouraging the habit of arguing from physical causes to human effects," ". . . to appreciate the importance of climate and physical structure in determining industrial and commercial development," ". . . the rest of the world to be treated with a minimum of detail." Although it is suggested that pictures form the "data" of a lesson, nevertheless most teachers favour the oral lesson (or even the lecture method), even though "the oral lesson tends to consist of generalizations." It is difficult to see how the excellent precepts in this book can be made to agree with the lesson outlined on pp. 123–8. In this case little attempt has been made to allow children to imagine accurately the real conditions of life of the people who live in the Yorkshire region. The detailed life of the people is forgotten in an effort to present neat lines and words. In the same way the outline lessons on pp. 161–4 start with unreal map-reading about physical features and climate as though they determined human life. On the other hand, on pp. 165–6 a more modern outlook is suggested in which pupils are asked to study for themselves at first hand pictures and specimens of human life and activity. The lessons begin this way, and the map work, relief, and climate naturally follow from pupils' inquiry concerning the initial study of reality. It is a pity that so much purely oral teaching should go on. The education of children by means of the invaluable contribution of Geography should transcend all other claims. This book says this clearly, but unfortunately fails to urge sufficiently the necessary improvement in general practice. N. S.

THE MONTHLY RECORD

PLANS FOR A BRITISH ANTARCTIC EXPEDITION

Plans have now been completed for another British Antarctic expedition to the Falkland Islands Dependencies. Those who have followed the fortunes of Mr. Rymill's British Graham Land Expedition, 1934–37, are familiar with the great sledge journey which led to the discovery of King George VI Sound. Dr. G. C. L. Bertram, who was a member of that party, will lead the new expedition, which has as its object the extension of Rymill's discoveries. The expedition will travel by ship down the west coast of Graham Land, and Dr. Bertram plans to make his base near the mouth of the Sound. The proposals, which were approved by the Council of the Society in November 1938, include sledge journeys direct south through the Sound to the western boundary of the Dependency, south-eastwards to the head of the Weddell Sea, and north-eastwards to connect with Nordenskjold's old base at Snow Hill Island.

EARLY MAPS OF JAPAN, NATIVE AND EUROPEAN

Writers who have dealt with the early cartography of Japan from the European side have rarely had the chance of studying the native material and have often tacitly or explicitly assumed that nothing worthy of consideration existed in Japan before the advent of Europeans, and that Japanese efforts in this direction were for the most part founded on European models. This may be true of world maps, but as regards maps of Japan itself is vigorously contested by Professor H. Nakamura in a paper printed in *Monumenta Nipponica*, published by the Sophia University at Tôkyô (vol. 2, No. 1, 1939). This writer contends that the maps of their own countries produced by both Chinese and Japanese draughtsmen had a distinct influence on early European cartography of the Far East. He is concerned chiefly with two maps of Japan preserved in European archives, one of which, now in Florence, was brought to light in 1931 by Professor Crinò, and described by him in the *Revista Marittima* of that year. Professor Nakamura gives a résumé of existing knowledge of early Japanese map-making, and shows that the Florence map has all the characteristic features of native maps of the "Gyôgi" type, reproducing, *e.g.*, the diagrammatic oval form of the provinces as well as other details. He gives a photographic reproduction of one of these maps, making possible a comparison with the Florence map reproduced by Crinò. The second map discussed was examined by Professor Nakamura in the Madrid Archives. It forms part of a MS. of fourteen leaves, dated 1587, embodying information on affairs of Japan obtained at Manila by Bishop Domingo de Salazar, with special reference to the relations between Japan and the Philippines at the time. The map is but a rough sketch, such as might be made from memory, but is again clearly in the main founded on a map of the Gyôgi type. Now a comparison of such native maps, of which some thirty are known, with the many European maps of the Vaz Dourado type is held to prove the dependence of the latter on the former to some extent, even though considerable modifications were introduced, especially in the nomenclature. It is thought probable that early sketches similar to those now at Florence and Madrid had found their way to Europe through the hands of Portuguese adventurers. Professor Nakamura has been a keen student of Japanese cartography for some years, having carried out researches both in English and continental libraries, and his views are certainly worthy of consideration.

EAST AFRICAN VEGETATION AND CLIMATE

In a paper entitled "Climatic classification from the standpoint of East African biology," published in the *Journal of Ecology* for August 1938 (Amani Memoirs), Mr. R. E. Moreau reviews the vegetation of Kenya, Tanganyika, Uganda, and Zanzibar in relation to existing and proposed schemes of climatic classification. He shows that the elaborate systems of Köppen, De Martonne, and others cannot be entirely adopted for East African purposes. These systems are based on normal conditions, taking no account of extremes which are biologically important. Moreover, as applied to East Africa, where relief is complex and meteorological stations few, they completely fail to take account of abrupt local contrasts in climate. Another scheme, based on rainfall and evaporation ratios and found useful in some regions, cannot be used in East Africa for lack of data. So the author is driven to propose a scheme based on temperature, length of influential rainfall period and the amount of rainfall in that period, though he does not expect this to be altogether satisfactory because it fails to take account of climatic extremes and rainfall "effectiveness" as depending upon intensity of the rainfall and the nature of the soil. His conclusions are entirely negative, as might have been foreseen, and afford a striking example of the impossibility of attempting to force complex natural phenomena like those of climate into categories which can only have limited utility for special purposes.

Nevertheless the very discussion is interesting in relation to the character of the vegetation of the area. A good deal of attention for instance is given to the biological importance of mist and cloud in the mountains of tropical Africa, which is never allowed for in classifying and mapping the climates of the region. These give rise to a particular type of evergreen forest known as "mist-forest" or, in German, *Nebelwald*, which differs in character from "rain-forest." The mountain mists are characteristically developed in sharply defined belts especially on isolated peaks and scarped plateaux. Their lower limit tends to rise with distance from the sea, being about 4000 feet in the East Usambara and 6000 feet on the south face of Oldeani. They supply what has been called "occult" or "horizontal precipitation" in localities where the rainfall, properly so called, may be small. Reference is made to Marloth's experiments on Table Mountain proving that vegetation can extract very large quantities of water from mountain mist. The general principle, of course, is familiar enough everywhere as fog-drip beneath trees.

THE DEATH OF REYNOLD BRAY

We have received from Mrs. Bray an account by Mr. P. D. Baird of the accident through which her husband, Mr. Reynold Bray, lost his life last September. The account was written by Baird at Igloolik, off the north coast of Melville Peninsula, in October, when the incidents were still fresh in his mind.

The accident happened on 14 September 1938, the thirteenth day of the whale-boat journey from Winter Island, near Repulse Bay. The previous day they had reached the first of the native camps in the Igloolik district. They set out early in the morning, hoping to make the second camp before night. There was a fairly strong wind from the north which increased during the day, but the north-easterly trend of the coast gave some shelter. After three hours they reached a point, round which the swell appeared to be very heavy. They therefore ran into the shore to prospect. In doing this, the propeller was damaged on a rock, and after having repaired it and worked at the motor, which was not going well, they decided to rest, and Baird waded ashore to find water. When he returned, the boat was farther out, the anchor having dragged. Bray attempted to pole her

in without success, and Baird then suggested to him to row a line ashore in the folding boat. This suggestion he regretted later, as the boat had very little freeboard and was not easy to steer. When he next looked, he saw Bray was trying to paddle in with one oar, and without a safety line attached to the whale-boat. He was making no headway but was out of control and was being blown offshore. Baird then waded out to the whale-boat, which was still within his depth. He removed the motor, still in pieces on the stern, and shipped the rudder, but owing to a hanging being broken, it was some time before he could hoist the sail and leave the shore. There was then no sign of Bray. The light folding boat had been blown out so fast, and the seas were so big a short distance out, that it is probable it had already been swamped. Bray was wearing long and rather tight-fitting rubber boots, which would have prevented his swimming. Baird cruised up and down for about an hour without seeing anything in the big seas.

The next day he cached the cargo, and walked back to the native camp. Thence he continued by native boat to Igloolik, and set out as early as possible for the H.B.C. post at Repulse Bay to send off the news. He proposed to return to Igloolik to carry out part of their plans on Baffin Island, crossing to Clyde Post in the spring.

A PORTUGUESE WORLD MAP OF THE SIXTEENTH CENTURY

Senhor Armando Cortesão, on whose previous service to our knowledge of old maps it is needless to dwell, has rescued from oblivion an important map of the first half of the sixteenth century by a hitherto unknown Portuguese cartographer, and he has discussed it in the *Geographical Review* for April 1939. Unfortunately only the western half of the original map—that embracing America and the Pacific—seems to have survived, and it is perhaps too much to hope that the other may yet be discovered. The author's Christian name, Antonio, appears on the western half, the surname having no doubt been given on the part now lost; but a note in a nineteenth-century hand records it as Pereira. No cartographer of the name is known, but a Captain Antonio Pereira is mentioned by the historians as serving with credit in the East in the second quarter of the sixteenth century; and as he appears to have been in Portugal in the period to which, on internal evidence, the map may be assigned, it is possible that he may have been its author. Senhor Cortesão gives close attention to certain crucial representations which may help to fix a fairly precise date, and which show it to possess some original features. In the Newfoundland region there is a general likeness to the maps of Desliens (1541) and Cabot (1544), but there are differences in the nomenclature. The improvements introduced—apparently on the authority of the Pilot Jean Alfonse (now claimed as by birth a Portuguese)—by Freire in 1546, and by Homem in 1550 and 1554 find no place, so it may be presumed that the map was made before 1546. On the other hand the Amazon is shown as revealed by the voyage of Orellana, which became known in Europe only in 1543, so that this gives an anterior limit. Pereira's map seems to be the first to represent the Amazon with the nomenclature supplied by Orellana (practically all the names are to be found in Carvajal's narrative), and the fuller details given by it and other Portuguese maps, as compared with the Spanish, can be explained by Orellana's detention in Portugal, and cross-questioning by the King, on his return to Europe. The representation of the gulf and peninsula of California is also of interest as being among the earliest extant—quite the earliest on a Portuguese map—another instance of up-to-dateness; it shows a close affinity with Cabrillo's well-known map of 1541, though not directly derived from it. Lastly, the Ladrones of Pereira agree to a large extent with the group as shown in the Cabot map, the earliest dated map

to insert the group, and of the nineteen names recorded several, including Guam ("Gaham"), are those still in use. Long after this the group was ignored by many cartographers.

Until lately the map was owned by Mr. Gyles Isham, having long been among the archives of his family at Lamport Hall, Northants; and as an ancestor is known to have been in Portugal with Princes Rupert and Maurice, it is possible that the map was brought or sent to England by him. In view of the long association of Captain Pereira with Far East, the loss of the eastern half of the map is much to be regretted. E. H.

REVISION OF THE AIR ALMANAC FOR 1939

The first edition of this Almanac appeared for the last quarter of 1937 and consisted of two parts, a permanent portion and auxiliary tables. The 1939 edition is in one part and, whilst retaining the main features of the earlier editions, has been extensively revised. The intervals of tabulation have been decreased, thus easing necessary interpolations and a whole sheet now contains all the data for one day. These sheets can be torn out when no longer current. Tables of sunrise, sunset, moonrise, and moonset have also been added. Ingenuity in arrangement of the interpolation folder and a generally improved lay-out contribute to greater ease and rapidity in use. G. C. F.

GEOGRAPHY PICTURE SUMMARIES

To meet the need for up-to-date geographical illustrations in schools, Mr. S. J. B. Whybrow and Mr. H. E. Edwards have prepared twenty sets, each containing thirty-two pictures arranged topographically, in a form suitable for use with the epidiascope (published by Messrs. George Harrap; *1s 4d* each set). Each set includes illustrations of physical geography, but the main emphasis is upon human life and activities. The pictures have been well chosen, and do not duplicate those found in text-books. They are accompanied by brief notes, which in some cases might have been expanded with advantage. It is unfortunate that the first two Australian sheets are entitled "Aridity," and the statement that the Eskimo of Greenland exchange blubber for European manufactures is misleading. Considerable care has been taken with the whole production, and it may be recommended to teachers as a useful adjunct to their geographical libraries.

AWARDS OF THE AMERICAN GEOGRAPHICAL SOCIETY

The Council of the American Geographical Society have made the following awards for the year 1939; the Cullum Geographical Medal to Professor Emmanuel De Martonne for his eminence not only in physical but also in human and regional geography; the Charles P. Daly Medal to Professor H. J. Fleure for his work in human geography and his allied studies in zoology, anthropology, and archaeology; and the David Livingstone Centenary Medal to Mr. John R. Rymill for "scientific achievement and exploration in the southern hemisphere," as leader of the British Graham Land Expedition, 1934–37. In making the latter award the Council states that "the survey work of this expedition constitutes probably the largest contribution of accurate detailed surveys on the Antarctic continent made by an expedition." The terms of these awards are given in full in the *Geographical Review* for July.

LIMITS OF OCEANS AND SEAS

The Oberkommando der Kriegsmarine has published, as a supplement to the *Annalen der Hydrographie*, May 1939, a paper on the limits of the oceans and neighbouring seas. This is accompanied by a map showing boun-

daries and names, and it is stated that these are to be employed in German hydrographical work in future. This system differs in certain respects from that proposed by the International Hydrographic Bureau (Special Publ. No. 23, 1937), and provisionally adopted by the International Hydrographic Conference, 1937. Any method of classification must be based upon the configuration of continents and islands, submarine relief, and to some extent upon conventional usage. Where there is general agreement on these points, the two systems naturally correspond, but in some cases the importance attached to the various considerations differ. Both systems abandon the Polar circles as limits. The German system however rejects the Bureau's representation of a continuous "Southern Ocean" around the Antarctic continent, and divides the waters into three seas, named with reference to the three great oceans, *e.g.* Indisches Südpolarmeer. On oceanographical considerations, the northern limit of these is placed in 55° S., in place of the varying rhumb-lines used by the Bureau. Similarly the three great oceans are divided into northern and southern sections by the equator, which differs somewhat from the Bureau's practice. This method produces a rather restricted Nordindischer Ozean, a subdivision not recognized by the Bureau.

The subdivisions into seas correspond in general, though their grouping and nomenclature differ in some instances. The German "Nordsee," for example, extends to include the Deutsche Bucht, Skagerrak, Kanal, and Irische See. The Davis Strait of the Bureau falls partly in the Baffin Meer and partly in the Labrador See of the German scheme, which also includes a Hudson-Meer more extensive than Hudson Bay. The Greenland or Norwegian Sea is shown as the Europäisches Nordmeer, divided, without limits being indicated, into Grönland-See and Norwegische See. In some cases, names in use have been confined within narrow limits, and other names given to the remaining area; *e.g.* Kara-See, is confined to the waters immediately east of Novaya Zemlya, and the remaining area, included under the name Kara Sea by the Bureau, is called Westsibirische See. The only new name introduced appears to be Südantillen-Meer for the area east of Cape Horn–South Shetland Islands. The Bureau's term, Northwest Passages, is translated as Kanadische Strassensee.

The advantages for scientific literature of a universally accepted classification and nomenclature of the oceans are obvious; it may be regretted therefore that it has been thought necessary to introduce a scheme which differs to some extent from that of the International Hydrographic Bureau.

OBITUARY

WILLIAM HENRY NEALE

The death of Dr. Neale recalls a great Arctic adventure in which he played a prominent part nearly sixty years ago. In the summer of 1880 Mr. B. Leigh-Smith set out in his steam yacht *Eira* with the intention of making a general examination of ice conditions in the North Atlantic and then pushing northwards in the direction which appeared to be most promising. The *Eira* was manned by twenty-five men, and Dr. Neale, then newly qualified, was appointed surgeon and naturalist. The expedition met with unparalleled success, for a navigable route to Franz-Josef Land was found, and numerous landings were made which resulted in important additions to knowledge of the archipelago.

The expedition of 1880 indicated that Franz-Josef Land might be of vast size; possibly almost continental in extent, and it also opened up a new and promising route to the Pole. In the following year the *Eira* again sailed north, and once more Mr. Leigh-Smith took Dr. Neale with him to look after the health of his crew. They reached Cape Flora with some difficulty, and there the ship was crushed in the ice and sank. Little time was available to save the provisions and other stores. A stone hut was built on shore, and all hands lived in it for ten long months of exceptional privation. Dr. Neale was much worried by the loss of all the lime-juice, then believed to be the only safeguard against scurvy. He had charge of the rationing, and successfully kept the party in perfect health on a diet of fresh bear and walrus meat. The preserved meats and soups were kept for the boat voyage and were not used during the winter. He was thus one of the first to demonstrate that fresh meat is a preventive of scurvy. Dr. Neale also found time to collect birds and animals, and he later recorded his natural history observations in the *Proceedings* of the Zoological Society.

The party took to their four boats on 24 June 1882, and spent forty-three days in a dangerous and exciting voyage southwards across ice-filled seas. Each night they disembarked on to an ice-floe and hauled up the boats to save them from the risk of being crushed. The whole party survived the ordeal of the winter and the voyage of nearly 600 miles to Novaya Zemlya, where they met Sir Allen Young's ship *Hope*, which had been sent out to search for them.

In the absence of Mr. Leigh-Smith, Dr. Neale described the adventures of this expedition at a crowded meeting of the Society. Years later he had the satisfaction of congratulating Lord Northcliffe on the success of the Jackson-Harmsworth Expedition, which had restored to him a stethoscope and camera "in good condition after being frozen in the ice of Cape Flora for fourteen years."

For nearly half a century Dr. Neale practised in St. John's Wood and South Hampstead, where, during a long life of active work, he attained a reputation as a gifted and skilful physician. He had been a Fellow of our Society since 1883, and will be missed by a large circle of friends. B. B. R.

MEETINGS: SESSION 1938–39

Annual General Meeting, 26 June 1939. The President, Field-Marshal Sir Philip Chetwode, in the Chair.

The HON. SECRETARY (Mr. W. L. Sclater) read the Minutes of the Annual Meeting held on 20 June 1938, which were confirmed and signed by the President.

The PRESIDENT then said: It is now my very pleasant task to present the Medals and Awards.

With the approval of His Majesty, the Founder's Medal has been awarded to Mr. Arthur M. Champion. Mr. Champion has spent thirty years in East Africa, largely in the administrative service of Kenya. For some years he was in administrative charge of the Turkana Province. On his appointment, Mr. Champion made it his duty to carry out the first systematic survey of the Province on a trigonometrical framework, producing a valuable map in six sheets on the scale of 1/250,000. In addition to this he investigated the physical geography and geology of the area, and more particularly of Teleki's Volcano

and the lava fields south of Lake Rudolf. He has communicated the results of his work in valuable papers to the Society, and has recently shown to us the film which he made on a motor journey across Africa from Cape Verde to Nairobi, carried out after he had retired from the Colonial Service. Mr. Champion has now made his home in Kenya, and we look forward to further contributions from him on the geography of East Africa.

Mr. A. M. CHAMPION: I do not know how to express my appreciation of the honour which the Society has done me in presenting to me such a coveted award as the Founder's Medal. During my journeys in Africa I had no idea that they would lead me to this. I should here like to express my thanks to those who have assisted me so much in the little I have done. I would like also to refer to the administrative officers of my Province, who often helped me greatly in the practical work in the field and in arranging the journeys for me. Further, I should like to offer thanks on behalf of the Colonial Service to which I had the honour to belong. And I do not want to forget those who were closest to my heart—the natives over whom I had authority. My requests perhaps seemed to them rather purposeless, and often they were evidently frightened, especially in the neighbourhood of volcanoes, when they seemed hardly able to control their fear. Nevertheless they followed me wherever I asked them to go. Sir, I thank you very much for this award.

The PRESIDENT: His Majesty the King has approved of the award of the Patron's Medal to Professor Hans Ahlmann, of the University of Stockholm, for his exploration and glaciological studies in the Arctic. He has specialized in studying the work of ice and snow, and for this purpose he organized and led the two Swedish-Norwegian expeditions to Spitsbergen in 1931 and 1934, and the Swedish-Icelandic expedition to Vatnajökull in 1936–37. The many important scientific monographs resulting from these expeditions have been noticed from time to time in the *Geographical Journal*, and we have had the pleasure on a former occasion of hearing a paper by him upon the physical characteristics of glaciers. Professor Ahlmann's work has stimulated much interest in this important branch of our science, and younger explorers and students owe a great deal to his encouragement and assistance. He is leaving in a few weeks time to continue his researches in north-east Greenland.

Professor HANS AHLMANN: I desire to thank you, Mr. President, and the Council of this Society most respectfully and sincerely for the medal I have just received from your hands. The great honour that you have done me in recommending me to His Majesty the King I must share with my colleagues the Swedish, Norwegian, and Icelandic scientists, sailors, and others who on our three expeditions were together in all friendship and unity of purpose. I cannot find words in which to express our gratitude for the way in which the Royal Geographical Society has shown its appreciation of our endeavours.

The PRESIDENT: The Murchison Grant has been awarded by the Council to Mr. Robert Bentham for his surveys and geological investigations in Ellesmere Land. Mr. Bentham first went to the Arctic with the Oxford University Exploration Club's Ellesmere Land Expedition in 1934. In 1936 he returned by himself to the police post at Craig Harbour, Jones Sound, where he spent two years making a plane-table survey of south-east Ellesmere Land, and in geological and archaeological work. He also made an extended journey to the north-west.

Mr. ROBERT BENTHAM: This award of the Murchison Grant was an unexpected honour, especially when I consider the small amount of work I was able to do in comparison with that done by previous recipients. While in Ellesmere Land, as the President has told you, I was engaged in survey, in geological, and

in anthropological work. The little I was able to accomplish is entirely due to the assistance I received from this Society and from various Fellows. I should also like to take this opportunity of expressing my gratitude to the Royal Society and the Geological Society, to whom I owe a very great debt of gratitude.

The PRESIDENT: The Back Grant has been awarded by the Council to Lieutenant-Commander R. E. D. Ryder, R.N., for his captaincy of the *Penola* and his marine surveys on the British Graham Land Expedition. Commander Ryder's achievement in navigating the *Penola* in high latitudes and often in uncharted waters, with a crew which had little nautical experience before leaving England, was a fine feat of resourceful seamanship. He also took every opportunity of extending our hydrographical knowledge of the island-strewn waters and coasts of western Graham Land, and his surveys have been incorporated in the official charts. Commander Ryder being absent on duty, I shall ask his father, Colonel Ryder, to accept the award on his behalf.

Colonel C. H. D. RYDER: I was fortunate enough to meet my son only two months ago in the Mediterranean, at the time he received news that he had been awarded the Back Grant. He asked me if I would, on receiving the award on his behalf, express his feeling of thankfulness to the officers and crew—out of sixteen only two were sailors—for the wonderful way in which they had assisted him. I can also add my appreciation, because I sailed in the *Penola* from Southampton to the Thames, and the way in which the amateur crew worked was truly remarkable.

The PRESIDENT: The Cuthbert Peek Grant has been awarded by the Council to Mr. W. V. Lewis for his physiographical studies in Great Britain and Iceland. Mr. Lewis, who is University Demonstrator in Geography at Cambridge, has taken part in one expedition and led another to Iceland. His interests are chiefly in the evolution of glacial features and of shore-lines, and he has also pursued these studies in Great Britain. At various times he has imparted to us the results of his observations on Dungeness Foreland, the Chesil Beach, and elsewhere on the English coast, as well as upon the coast of south-east Iceland.

Mr. W. V. LEWIS: I thank the Council of the Society very much indeed for their generosity in awarding me the Cuthbert Peek Grant. I shall use it when I go to Norway in August to extend my work on glaciers and morphology to that delightful part of the world. I should also like to take this opportunity of expressing views which, I know, are shared with many others of my own age, and that is, to thank the Society for the help and encouragement it gives to people at the outset of their geographical careers. The support of this Society opens up channels in so many other directions, especially in the publication of results. I desire therefore to express my thanks not only for this particular grant but for the continued assistance which I have received from the Society for many years past.

The PRESIDENT: The Council have awarded the Gill Memorial to Mr. J. V. Harrison for many years' exploration in Central and South America, and southern Iran. Mr. Harrison, who is a geologist by training, saw active service during the War with the Royal Engineers in Mesopotamia. Since then he has been engaged on topographical and geological surveys in Iran, Mexico, Venezuela, Colombia, Honduras, and the West Indies. In particular he has described to the Society his journeys and surveys of the mountainous and inhospitable Bakhtiari and Kuhgalu country in south-western Iran, formerly difficult of access to travellers and unsurveyed, the homes of restless tribes. Mr. Harrison's work has not only provided us with our first precise knowledge of the topography of these regions, but has also contributed to the elucidation of some major problems of the earth's structure. He is now at work in the Central

Andes of Peru, and I shall ask Dr. G. M. Lees to accept this award on his behalf.

Dr. G. M. LEES: Dr. Harrison would have expressed his great appreciation of the honour if he had been able to be here. He is one of our greatest enthusiasts in geographical and geological travel and research, and his explorations in Central and South America and southern Iran are examples of his work. I am sure that he will be greatly stimulated by your recognition of his efforts, and on his behalf I thank you very much.

The PRESIDENT then read a summary of the Presidential Address, which is printed on pp. 185–91.

Visitors having withdrawn, the PRESIDENT appointed Colonel C. H. D. Ryder and Mr. S. de V. Merriman to act as scrutineers of the ballot for the Officers and Council for the ensuing year.

The PRESIDENT then submitted the Annual Report of the Council.

The Rev. M. J. STEWART: May I suggest that paragraph 7 of the Report be considered? It states that "it is not possible to add to the list of public and university libraries receiving the *Journal* as a gift." Perhaps we should try to get members to come forward from sources so far untouched, and there is no more promising field than the public and university libraries.

The HON. SECRETARY (Mr. W. L. Sclater): I think that most of the university libraries receive the *Geographical Journal*. The exchange list is a long one, and we cannot add much to it, though each year a few additions are made. If you, sir, would care to examine the list, we should be pleased to show it to you.

The Rev. M. J. STEWART: I am convinced that what is possible is being done, and I have nothing more to say.

There being no further comments, the Report was unanimously adopted by the Meeting, after which the scrutineers informed the President that the candidates proposed by the Council had been elected. (See list, p. viii.)

Rear-Admiral Sir EDWARD INGLEFIELD: I would like to say—and I know that I am voicing the feelings of all the Fellows of the Society—how sincerely grateful we are to Sir Philip Chetwode for so kindly accepting the Presidency for another year. We are well aware that it is a heavy addition to the burdens he carries as a result of occupying the chair of several other societies, besides the many other activities incidental to his position. It is of the greatest value to the prestige and influence of the Society in its relations with British and other governments that the name and personality of the President are of world-wide renown; especially is he known in India and the East. We are therefore very grateful to the Field-Marshal for accepting the office.

The PRESIDENT: I am indeed most grateful for your words. In my view it is a tremendous honour to a man who has no scientific knowledge to be asked to take the Chair at the proceedings of a Society of such world-wide reputation: it is far more of an honour to me than an advantage to you.

THE ANNUAL DINNER

The Annual Dinner of the Society was held at Grosvenor House on Monday 26 June 1939.

The President and Lady Chetwode received the company, which included among the guests of the Society H.E. the French Ambassador, H.E. the Polish Ambassador, H.E. the Norwegian Minister, H.E. the Swedish Minister, the Most Reverend William Godfrey, Apostolic Delegate, the High Commissioner for Canada and Mrs. Vincent Massey, the Chief of the Imperial General Staff, Air Chief Marshal Sir Cyril Newall and Lady Newall, the Warden of Nuffield

College and Mrs. Butler, the Master of the Mercers' Company, Professor Hans Ahlmann, Mr. Arthur M. Champion, Colonel C. H. D. Ryder, Mr. W. V. Lewis, Mr. Robert Bentham, and Dr. G. M. Lees.

After the loyal toasts had been honoured, H.E. the FRENCH AMBASSADOR, in proposing the toast of The Royal Geographical Society, said: In entrusting me with this task, I wonder if Sir Philip Chetwode was thinking of a sally of the Chancellor of the Reich, Prince Bismarck, who declared one day, when he was doubtless out of humour, that one can always recognize the French Ambassador by the fact that he does not speak the language of the country to which he is accredited, and has a complete ignorance of geography. As it will be easy for you to verify while listening to me that the first of these assertions is only too true, you will certainly be tempted to believe that the second is equally correct.

Fortunately for the reputation of my fellow-countrymen, there has always existed a close relationship between the geographers of our two countries. It is true that there was a time when those who in Great Britain as well as in France contributed most in their own way to the development of geographical knowledge—for instance, the great commercial companies, the navigators, the buccaneers—did not show very friendly feelings towards each other when they met in distant waters. But the Royal Geographical Society came into being at a moment when scientific curiosity was beginning, at any rate as far as the geographers were concerned, to take precedence over the fever of commercial conquest. In the very first years of its existence the Society appointed foreign correspondents, among whom was the French navigator Dumont d'Urville. In the support that the Society has generously given to the most notable discoveries or studies it has always kept a large share for the most deserving foreigners. A few of my compatriots have had the high honour of receiving the gold medal of your Society, which is one of the most sought-after awards among geographers.

More recent manifestations of fellowship took place at the celebration in Paris of the centenary of the Société de Géographie, to which you were good enough to send a representative in the person of your then President, Sir Francis Younghusband. Similarly, a French delegation presided over by Jean Charcot came several years later to London when your Society was celebrating the completion of its first century. Such expressions of solidarity are more than a mere formality. They bear witness that your Society has always drawn inspiration from the true scientific spirit which knows no frontiers and is aware that sincere and universal cooperation alone can promote advancement in the human sciences and open out new channels to civilization.

The commemoration to which I have just referred gave the Royal Geographical Society an opportunity of casting a glance into the past and taking stock of the distance travelled since its foundation. No one is ignorant of the considerable part played by Great Britain in the improvement of geographical knowledge, and it may be said that, thanks to your sailors, your missionaries, your explorers, the advancements of this science have been so many stages in the extension of the British Empire. But the heroic times of exploration and discovery are coming to an end. Those large empty spaces which appeared of old on our atlases have disappeared to-day from the map of the world. However there is still a very vast field open to the geographer, and there are still many regions where the curiosity of the traveller can exert itself efficaciously. But instead of the great voyages of discovery and survey which were embarked upon in the olden days, more methodical campaigns now have to be undertaken with a view to making exact reports on the economic value of the various parts of the earth. Here geography—at least it is thus that I picture its rôle—will call mineralogy, botany, and anthropology to its aid in order to examine in greater

detail the domains laid bare by the explorers. Our planet seems at times to be too small for its inhabitants. To-day when the regular flow of emigration is at a standstill, the exodus of populations goes forward in conditions of the greatest disorder and confusion. Quite recently when international deliberations took place to examine the refugee problem, which is one of the most pressing and dramatic of modern life, we were able to realize, independently of obstacles of a political nature, of what great assistance would be a more complete knowledge of those regions which remain to be colonized. Let us not forget that the greater part of the economic difficulties from which we suffer will only be solved by the prosperity of new human agglomerations becoming in their turn so many centres of consumption and offering an outlet to an ever-increasing production.

Is it not the function of geographers, by the disinterested study of physical and climatic conditions, to prepare the work of engineers and mine prospectors, to provide for the establishment of new cultures; in a word, to prepare the mobilization of the resources of the Earth?

I apologize for touching upon questions with which doubtless you have long been familiar. There are few learned societies which have been able, as yours has, not only to fulfil the aims which were assigned by its founders but to exceed in considerable measure their highest hopes. The encouragement and material support that the Society has lavished upon explorers have associated it with the majority of great discoveries of the nineteenth and twentieth centuries. Its persevering efforts have succeeded in imposing the study of geography in the great universities. It has thus acquired over a long period the respect and the esteem of geographers throughout the world. At the same time, the latter admire the manner in which the Society has remained faithful to all the rules laid down in its statutes.

In proposing the toast of The Royal Geographical Society I would like to associate with it the name of your President, Sir Philip Chetwode. By the remarkable geographical knowledge which he has acquired in the various countries in which he has seen service, in Africa and in Asia; by his judgment, by his flair for organization and also as former Chief of the Indian Army, from which so many pioneers have left for the study of the most inaccessible mountain regions of central Asia, Sir Philip possesses all the desirable qualifications for such an important position, where he shows himself the worthy successor of Murchison, Markham, and Lord Curzon, to mention only a few of the more celebrated Presidents of your Society in the past.

Once again I pay homage to the work accomplished over more than a century by your great Society in contributing to the development of geographical sciences and in helping in the formation of an Empire which is such a magnificent illustration of the genius of the British nation.

I give you the toast of The Society, coupled with the name of the President, Sir Philip Chetwode.

The PRESIDENT in responding said: We are greatly honoured to-night by the presence of the representatives of several countries with whom our own is in alliance. H.E. the French Ambassador has added to our debt by proposing the health of our Society in the course of a most eloquent speech. I wish I could do half as well in his language.

We live to-day in amazing and dangerous times. I wonder if you will think it strange if I say that to me they are very stimulating times. I do not say that because I happen to belong to one of the fighting services the members of which that distinguished Viceroy, Lord Curzon, once alluded to as "liveried assassins." I do not say the times are stimulating to me because, after all the experience I have had of war, I would like to see another, for that would mean mass assassina-

tion on the greatest scale that has ever been known. There is not the smallest doubt that we are to-day living in one of the greatest moments in history, at a time when our Empire and the French Empire are taking, perhaps, the greatest part they have ever taken together in history. We are living in a period in which we are practically at war, for there is being waged a tremendous struggle between what are termed nowadays ideologies. Your Excellency, it is a wonderful and comforting reflection that the nation you represent, which has the same ideals of government, of life, and of individual freedom and liberty that we have, is standing with us four square against those people and their leaders who would force upon the world and upon our nations a system of life which we would regard as little better than death. It is surely a stimulating thought that in that grave task our two nations are the leaders of those people in the world who think as we do and value what we value. I am well persuaded that if we maintain that spiritual and military alliance which now exists between us in such great strength, we shall win through in the end and our peoples will be free to order their lives as they choose.

I stand to-night in the place of the late Professor Balfour, who was for two years President of the Society but was unable to complete his term of office owing to illness which eventually caused his death. No man ever so wholeheartedly gave his time and his great knowledge to any society, and our Society in him has lost a great brain and a great friend.

Those who were present at the Annual General Meeting this afternoon are aware that the Society has had on the whole a prosperous year. Perhaps the only thing your Council could wish had gone better is increase of membership. I, together with your Council, cannot impress sufficiently upon all Fellows of the Society the enormous importance of increasing membership if we are to continue to support actively the cause of geography throughout the world. The Society's *Journal* is already sent out to some seven thousand individuals and societies all over the world. If every Fellow who reads my words would try to get one new Fellow, it would make all the difference to our position. Never has a knowledge of geography been of more importance not only to the man in the street but especially to statesmen. I am sorry to say that there have been moments lately when members of the Government have at times shown that they do not possess the necessary knowledge of geography. In fact, owing to the activities of statesmen the map of Europe has changed so rapidly that mapmakers are entirely unable to keep pace with the necessary alterations. I recently purchased a wall-map to illustrate a lecture and found that many of the recent changes in Europe had been put in by hand. Nobody has time to keep pace with them.

During the past year the Council received some important memoranda on the general activities of the Society. These were referred by the Council to a sub-committee under the chairmanship of Sir Francis Younghusband. His committee submitted a most valuable report, and the Council are taking steps to act upon its recommendations. One of them affects the public activities of the Society: namely, the question of giving our well-known evening lectures more topical interest. As H.E. the French Ambassador has said, the day of major exploration of unknown countries is practically at an end. It is therefore not possible for those who lecture to the Society to deal entirely with new exploration, though we receive interesting accounts of intensive research in comparatively unknown parts of the world by specialized parties, for whom there is still much work. The Committee suggested, and your Council agreed, that it is not only desirable and important, but will probably interest a large number of our Fellows, if we arrange for lectures on human geographical problems in

connection with those parts of the world which are politically so much before the public. We propose to do that.

I thank Your Excellency for the most kind way in which you proposed the health of the Society of which I have the honour to be President.

Sir MALCOLM ROBERTSON said: Our President has called upon me to-night to propose the toast of The Medallists. Those of you who have read that monumental work on the Peace Conference may remember a short paragraph in which it was stated that four experts had set out from here to deal with a specific country. Unhappily, there was added a footnote to say that none of the four experts had ever been in that country. I find myself much in the same position now. Your Medallists have been awarded medals for exploration in various parts of the world with which I not only have no acquaintance at all, but with which I trust I never shall have any acquaintance.

The first name I have to mention is that of the winner of the Founder's Medal, Mr. A. M. Champion. He was a decent and God-fearing administrator of one of our colonies, but, not content with that, he must needs go out of his way to geographize, geologize, volcano-ize, and indulge in every other sort of -ize all over the central and eastern part of Africa and, moreover, he travelled by car from Cape Verde to Nairobi. His travels were made in relatively warm climates, sometimes very hot climates. He thoroughly enjoyed them and has told us so in various admirable papers. A very distinguished public servant whom this Society honours with a gold medal, and very rightly honours. It is on men like Mr. Champion that we rely to maintain our Empire and to carry out the promise of which the founders of that Empire dreamed.

Turning to the winner of the Patron's Medal I have to name Professor Hans Ahlmann, a distinguished Swede who is making a name for himself as great as that made by some of his renowned countrymen the world over. Professor Ahlmann apparently dislikes anything to do with warmth. He prefers to work with ice and snow and to study the physical characteristics of glaciers. He has done an immense amount of research and helped other explorers and students in this subject which is absorbing to them.

In conclusion, I think it would be the wish of all present that I should express to the Medallists our real feelings about them, that if we admire to the full their intrepidity, we also know that it is on them that the world depends for the advance of scientific geographical knowledge, and that they do their work for the present and future well-being of the world.

I think you would also wish that I should express, on your behalf, our very deep regret that Fru Ahlmann has been unable to accompany her husband on this occasion, because she is lying ill in hospital in Stockholm. We all express to Professor Ahlmann our most cordial wishes for her speedy recovery. I feel that he very deeply regrets the absence of his wife to-night, not only obviously on account of her illness, but that she should not be here to witness his triumph.

It is with the greatest pleasure and with a deep sense of the honour, that I ask you to rise and drink the toast to The Medallists.

Professor HANS AHLMANN: When I attempt in a language not my own to respond to the exceedingly kind but too flattering words of Sir Malcolm Robertson I find it impossible to express sufficiently my thoughts and feelings. The Arctic and sub-Arctic regions are now in great part explored superficially, but the work of the geographer is not ended. In fact, it is just beginning, for the enigma of the Ice Age cannot be solved until we can thoroughly understand how the existing glaciers grow, live, and die. The problems of snow and ice can be studied more profoundly in the Arctic than in any other part of the world, and

they demand the geographer's attention more, perhaps, than anything else. In the attempts which I and my colleagues in Sweden, Norway, and Iceland have made to discover the secrets of the glaciers we are largely indebted to British pioneers in the Arctic and we have also the satisfaction of seeing other Englishmen succeeding us. I refer in particular to the very successful Oxford University Arctic Expedition in 1935 and 1936 under the energetic leadership of Mr Glen.

In the present state of world finance it is proper that scientists should take an interest in the economy of the glaciers. That income of snow and expenditure of melting and evaporation must decide whether there is to be a surplus or deficit in that budget. At present the Arctic is being slowly but steadily disrobed of its beautiful mantle of snow and ice. But the very remarkable change that has taken place is probably only a temporary fluctuation greater than others which have rippled over the nearly constant climatic cycles of the last few centuries. One day the glaciers' income of snow will be again greater than the expenditure by melting and they will flourish, reflecting I trust a more prosperous world.

I had hoped to make an end this summer of my glacial work in the Arctic, but the medal which I have received to-day compels me to new endeavours. It is my duty to thank you all for granting me fresh encouragement.

Mr. A. M. CHAMPION: I welcome this opportunity of thanking you, sir, and the Council of the Society and also of expressing my appreciation of the honour which has been conferred upon me. Never for a single moment as I trudged the sands of Africa or travelled over the volcanic lava which surrounds Lake Rudolf did I dream that my tired feet would lead me to be one of the Society's honoured guests here to-night. You have heard from Sir Malcolm Robertson something of the little I have done, so that there is not much that I have to add.

Unlike so many predecessors who are well known in the world of science and exploration I am a very ordinary officer of the Colonial Administration whose lot it has been, due perhaps to my unhappy condition of celibacy, to have been posted more frequently than my fortunate married brother officers to the more remote areas far from the amenities of modern life. I should like to say that the interest I developed as the result of being sent to those far distant places received much inspiration from one who has been my great friend and who I am sorry to say is not here to-night. I refer to Mr. Hobley, who, as you know, was for three years a member of the Council of the Society. When I arrived in Africa thirty years ago he was my first Provincial Commissioner, and I owe more to him than I can possibly say.

The natives entrusted to my care have always been my first charge, but in my efforts to find out and get first-hand knowledge of the way in which they live and their struggle for existence I found that I really did not know exactly where I had been, especially when in the northern portions of Kenya, on the borders of Abyssinia, and in the Sudan. The large blank spaces were very obvious on the existing maps, so we set ourselves to try to fill them by the use of theodolites, plane-tables, and compasses.

I should like here to acknowledge the very welcome collaboration of the Sudan Government, and especially of the Inspector of Surveys, Mr. Wakefield, who took such kindly interest in the work that I was doing. As a result my triangulation was joined up to points which were fixed by him much more accurately than I could possibly have fixed them. In connection with the geological and other collections I must thank those who helped me, and especially Colonel Campbell Smith, the Keeper of the Mineral Gallery at the British Museum.

On one occasion I had been climbing a number of mountains in order to set

up the instrument and the natives wearily followed me up to the top, where I had what seemed to them a rather unpleasant habit of collecting stones. They naturally could not understand what I wanted them for. They asked me on many occasions, and evidently I did not give very satisfactory replies. Eventually I told them that I was going to build a house in England of African stone. Next morning when I looked out of my tent I was surprised to see a large heap of stones, and I wondered what had happened. A native came up and in answer to my inquiry said: "Well, *bwana*, if you really do want stones, need you take us to the top of the hills to get them?" Any credit due to me for making these collections must be shared by those long-suffering natives who so cheerfully allowed themselves to be grossly overloaded, often under most trying circumstances.

I regard this gracious recognition of my humble achievements as an undoubted compliment to the Service to which I so recently belonged and which includes so many young Britons, who are not only devoting the best part of their lives to the uplift of the African but also adding very materially to our knowledge of the once Dark Continent.

Sir GEORGE CLERK, in proposing the toast of The Guests, said: Before I embark on the task which lies before me this evening I should like, Mr. President, to strike one personal note. I have heard to-day that the Council and Fellows of the Society have done me the great honour of electing me to succeed the Foreign Secretary of the Society when he resigns his office next November. I feel all my inadequacy properly to succeed my distinguished predecessor, Lord Howard of Penrith, whose resignation we all deeply regret, and I can only say that I will to the best of my ability endeavour to maintain the tradition which he has so well established.

It is now my pleasant duty to propose the toast of The Guests. With so distinguished a list before me I feel rather like the Public Orator of Oxford at an Encaenia but, alas, without his epigrammatic capacity for saying the right thing about everybody in two or three sentences, nor with his advantage of being able to veil my inadequate words in a dead language.

I must begin by expressing our regret that H.E. the Turkish Ambassador, the President of the Royal Academy, and the President of the Société de Géographie de Paris have at the last moment been prevented from being with us to-night. General Perrier, who was in London this morning, was recalled to Paris by the sudden illness of his son, and I am sure we all extend our warmest sympathy to him, and hope that his son will speedily recover. I am particularly sorry that the Turkish Ambassador cannot be here, for he and I—he, as you know, was for a long period Foreign Minister in Turkey—worked together for six years in Ankara. It would have given me great pleasure to have been able to congratulate him personally to-night on the happy relations now so firmly established between his country and our own, and so largely due to His Excellency.

We are honoured with the presence of another colleague of mine, if I may still be allowed to call myself a colleague, H.E. the French Ambassador. Our President has already expressed, in language much more felicitous than I can hope to use, our appreciation of His Excellency's presence, and I need say no more about him. We are also most glad to welcome H.E. the Polish Ambassador. Throughout history we have always had a place in our hearts for Poland, and recent events have shown that our sympathy for that country is no mere platonic affection. It is most pleasing that Scandinavia, that great mother of dauntless explorers and travellers, should be represented here to-night by the Norwegian Minister and the Swedish Minister, the more so as another dis-

tinguished Scandinavian, Professor Hans Ahlmann, has just received the greatest recognition we can give of brilliant geographical work.

Another very welcome guest is the Apostolic Delegate, the Most Reverend Dr. William Godfrey. Whatever a diplomat may feel about some of his *chers collègues*, he can, in my experience at any rate, always be sure that he can count upon the friendliness and wise and helpful counsel of the Representative of the Vatican, and we are confident that Dr. Godfrey will maintain that tradition here in London.

Then it is good to see that two of the hardest worked men in our country, the Chief of the Imperial General Staff, General Viscount Gort, and the Chief of the Air Staff, Air Chief Marshal Sir Cyril Newall, with whom we are glad to see Lady Newall, have found time to be with us. Their responsibilities are enormous, but we know, and in these critical days we are thankful to know, that their broad shoulders can carry the burden.

We are also happy to have with us the Warden of Nuffield College and Mrs. Butler. Mr. Butler is not only a man of the highest academic distinction but also an internationalist in the best sense, in the sense that the Royal Geographical Society is international. His sterling work at Geneva has justly earned him a world-wide reputation. And now he has left all that to devote his remarkable gifts to one of the most interesting and far-reaching developments of our time—the institution which we owe to that outstanding Englishman Lord Nuffield.

It is also good and appropriate that the City of London should be represented here, as it is, in the person of the Master of the Mercers' Company, Brigadier Clementi Smith. The great London companies are an integral, important, and almost, to the outside world, unexplainable part of English life, and we are proud to welcome the head of one of them amongst our guests.

I have left to the last all mention of one who is, in a sense, the most important of all our guests, in that he has to reply on their behalf to this toast. But indeed the High Commissioner for Canada and Mrs. Massey are so well known to us all that it is almost superfluous to extend to them that welcome which they must know is theirs wherever Englishmen forgather. But this I must say: Our King and his gracious Consort have just returned from the great Dominion of Canada, where they were received with an unprecedented demonstration of loyalty and affection. We in this country, who know our King and Queen, were confident that they would win every heart throughout their long journey, but I am sure that Their Majesties would agree that the golden way had been largely paved for them by the work of Mr. Vincent Massey.

I give you the toast of Our Guests, coupled with the name of the High Commissioner for Canada.

The HIGH COMMISSIONER FOR CANADA (The Hon. Vincent Massey): It is a pleasure to be here this evening and an honour to convey on behalf of the guests our very sincere thanks for the most kind hospitality we have so much enjoyed. Apart from the pleasure of meeting the members of this distinguished Society, we are glad to know more about its work. Geographers, I feel, must be very modest—almost shrinking—people, for we hear far too little about their achievements, collective and individual. We are, of course, aware of the activities of the Royal Geographical Society, we pass the well-designed building which houses it, and we see its *Journal* in our clubs, but how rarely does the layman come into intimate contact with its work, and learn to know it for what it is—a treasure house of records of past achievements in exploration and a nerve centre of present-day activities throughout the world.

I assume that it has often been observed at these Annual Dinners that to most of us the word "geography" conjures up a memory of a particularly dull hour

in our school curriculum. We have chilly recollections of dreary catalogues of rivers and mountain ranges, which we recited with little knowledge of the influence those rivers and mountains have had on the history of man. It was really rather clever of schoolmasters to be able to extract so successfully all interest from a naturally fascinating subject, yet it was often done. Happily now there is a broader point of view

An eminent contemporary has suggested that the distinction between geography and history is that the former is about maps and the latter about chaps. We have outgrown that unfortunate over-simplification. If geography is the study of man in relation to his environment we may regard geography as being happily related to both maps and chaps. Maps have become very popular things in present times. There is a boom in old ones—we seem to regard them literally as illuminating objects, for we use them as lamp shades. Perhaps it is not too fanciful to say that there was something symbolic in this.

There is a boom in new maps too. The trade must be brisk because maps no longer will keep. There can be nothing stable about a map in a world in which boundaries fluctuate to and fro. I admire the enterprise of the map dealer in London who has a notice in his window "Your European maps brought up to date while you wait."

One question we naturally ask ourselves is, "What is left to the explorer to do?" "What areas still remain for his conquest?" To the layman there seems little left to be done. Man even has been able to look down on Everest. We seem a long way from the days when medieval geographers labelled large spaces of the earth with the ominous words "Here are griffins, hydras, and chimaeras dire." I cannot help thinking that this formula may have to be applied again as certain regions in these days seem to pass from supposed civilization into the mists of a neo-barbarism. I may say that we still have work for the explorer in Canada. We have plenty of geography. A coloured woman in the southern States in reply to a visitor who asked if she had any corn pones (a humble cake made with maize flour), said "Yes, sah! Corn pones is de one thing we ain't got nothin' else but." I don't want to suggest for a moment that we have not got many other things in our sub-continent, but on our northern frontier there are still great regions to be mapped and a long vista of discoveries still to be made. In the task of exploration we have been happy to welcome the encouragement of this Society. I need not mention the British-Canadian Arctic Expedition of 1936, and the party which surveyed the little-known coast of Ellesmere Land a year or two ago. The Government of Canada is happy to lend its cooperation in all such efforts. There is plenty of room for the adventurous in our north country and plenty of romance still to be found. In 1937 there was actually discovered by accident a new North-West Passage, when the Hudson Bay steamer *Nascopie* on her annual voyage was surprised to meet a schooner in Bellot Strait coming from the opposite direction. The aeroplane is playing its part in exploration. A few years ago two of our scientists flew over the Magnetic North Pole, and over 770,000 square miles have been mapped from the air.

But this is no time to inflict on you an account of exploration in Canada. Let me return to the task which I was assigned and to thank you, Mr. President, and your colleagues most warmly and sincerely for the very happy evening you have given your guests.

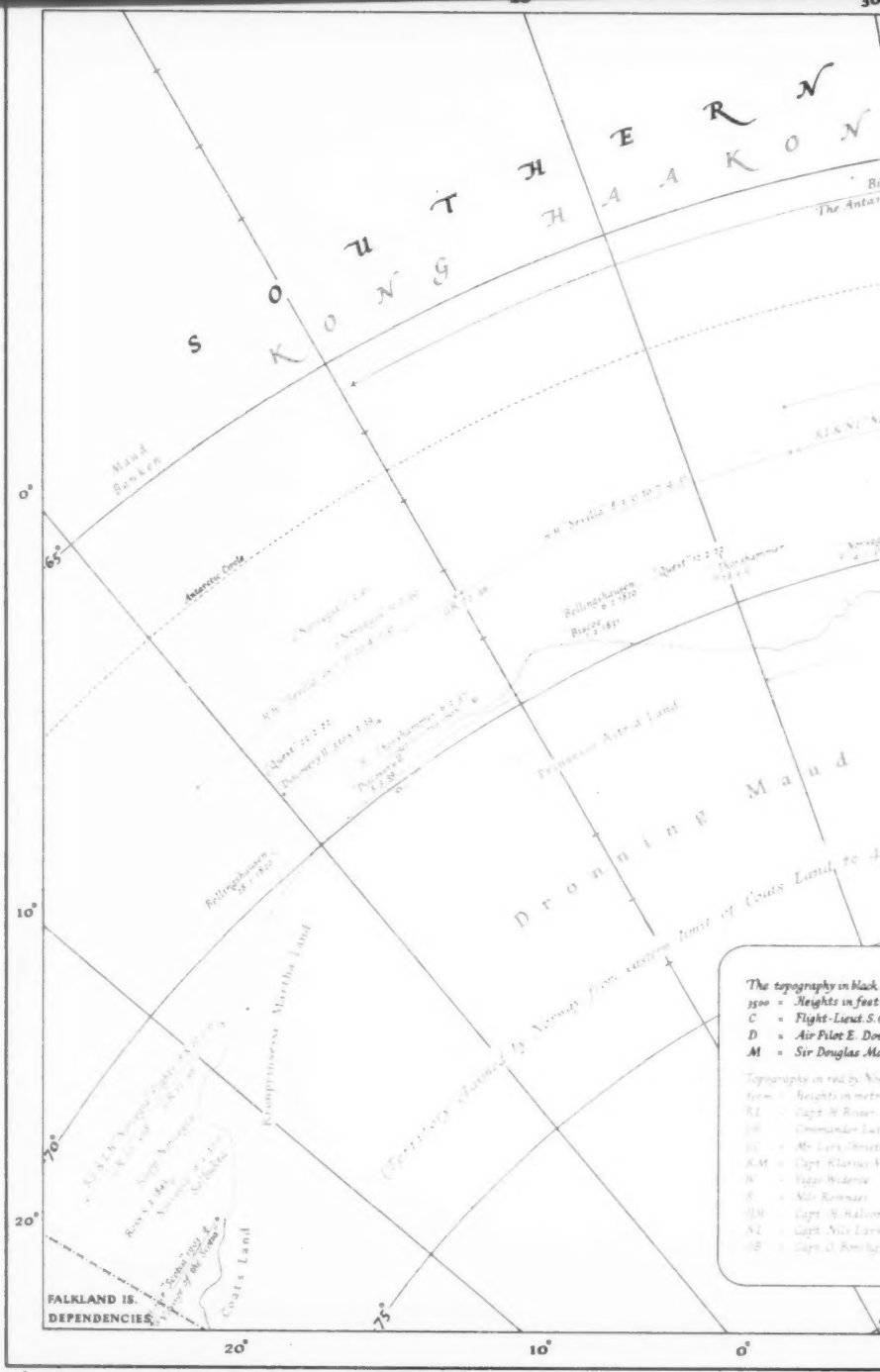
THE COURSE OF ANTARCTIC EXPLORATION

RATION BETWEEN LONGITUDES 20°W. AND 110°E. : map to acc

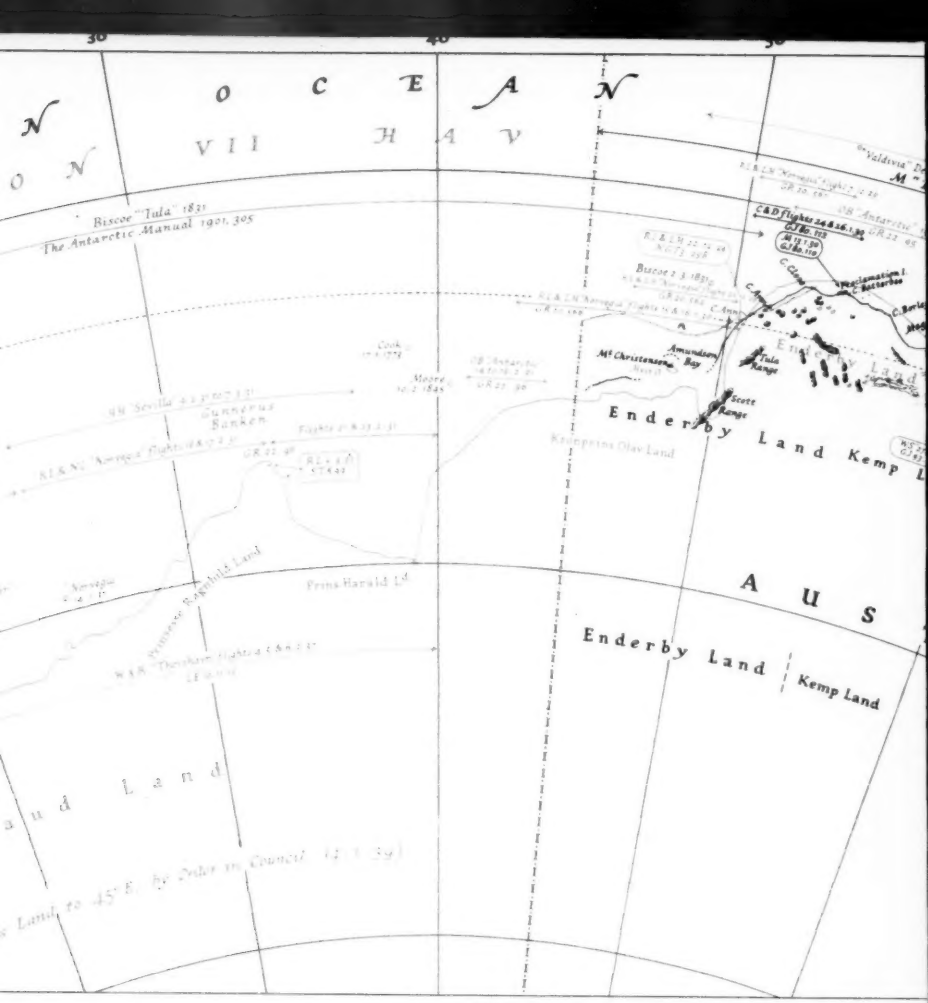
60°
65°
Kemp Land
(Kemp 1833)
Kemp Land
Kemp Land
Kemp Land

ccompany the paper by Mr. Lars Christensen on "Recent reconnaissance flights in th

75°
66°
M & C flight 9.2.31
G.J. 80. 119
The Four Ladies Bank
68°
ELIZABETH LAND
(Adm. Chart No 3171)
Vestfold Fjellene
Sørdal Breen
Ranvik Fjor
Larsemann Fjord
INGRID CHRISTENSEN LAND
80°
80°



Compilation and outline by H. F. Milne: writing by C. E. Denny.


O C E A N
V I I
H A V
Biscoe "Tula" 1831
The Antarctic Manual 1901, 305
Enderby Land
Kemp L
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Enderby Land
Kemp Land
Mt Christensen
Amundsen Bay
Tula Range
Scott Range
Cook
Moore
Gunnerus Bank
Prins Harald Ld
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Biscoe 3 3 1831
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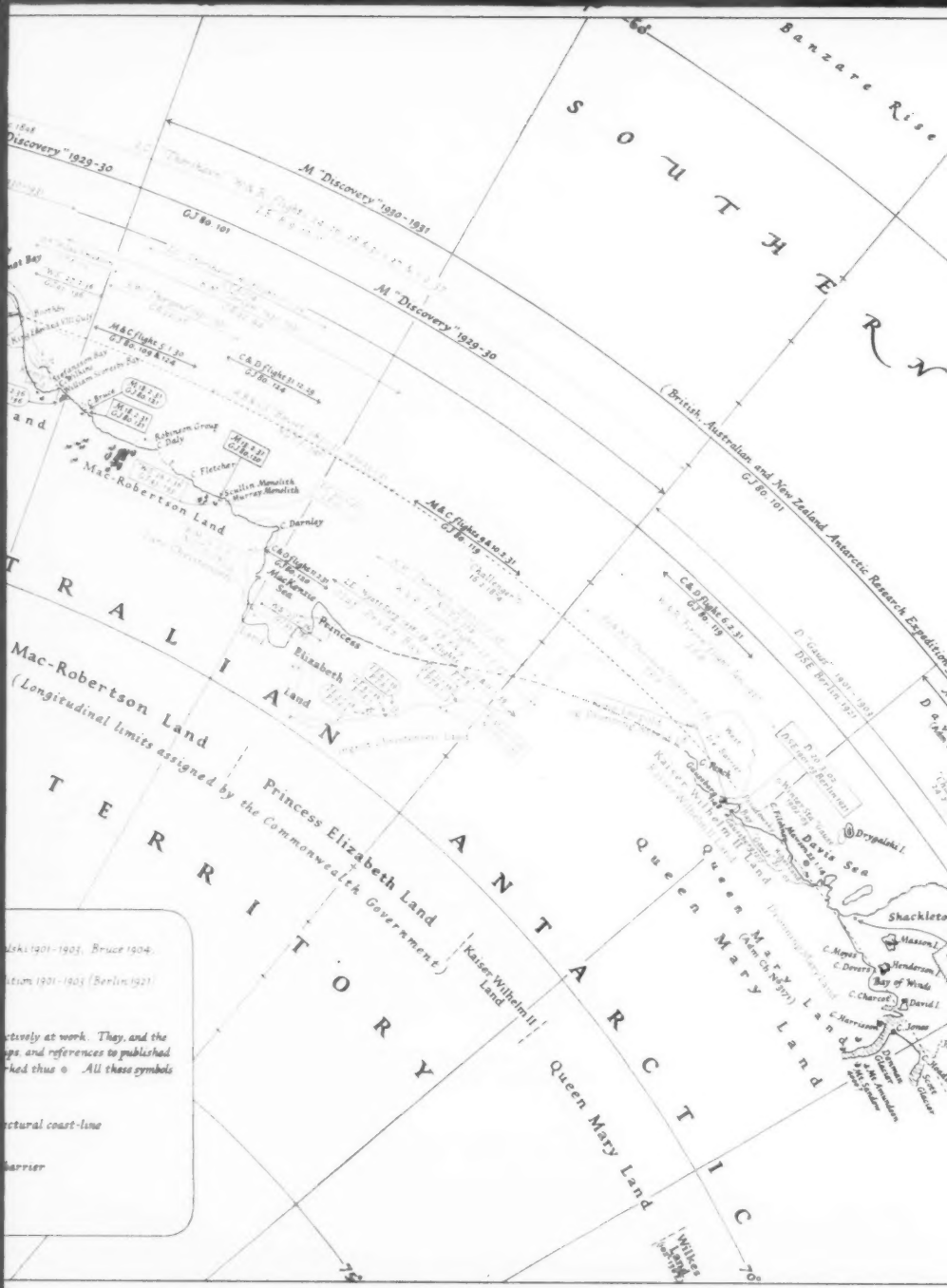
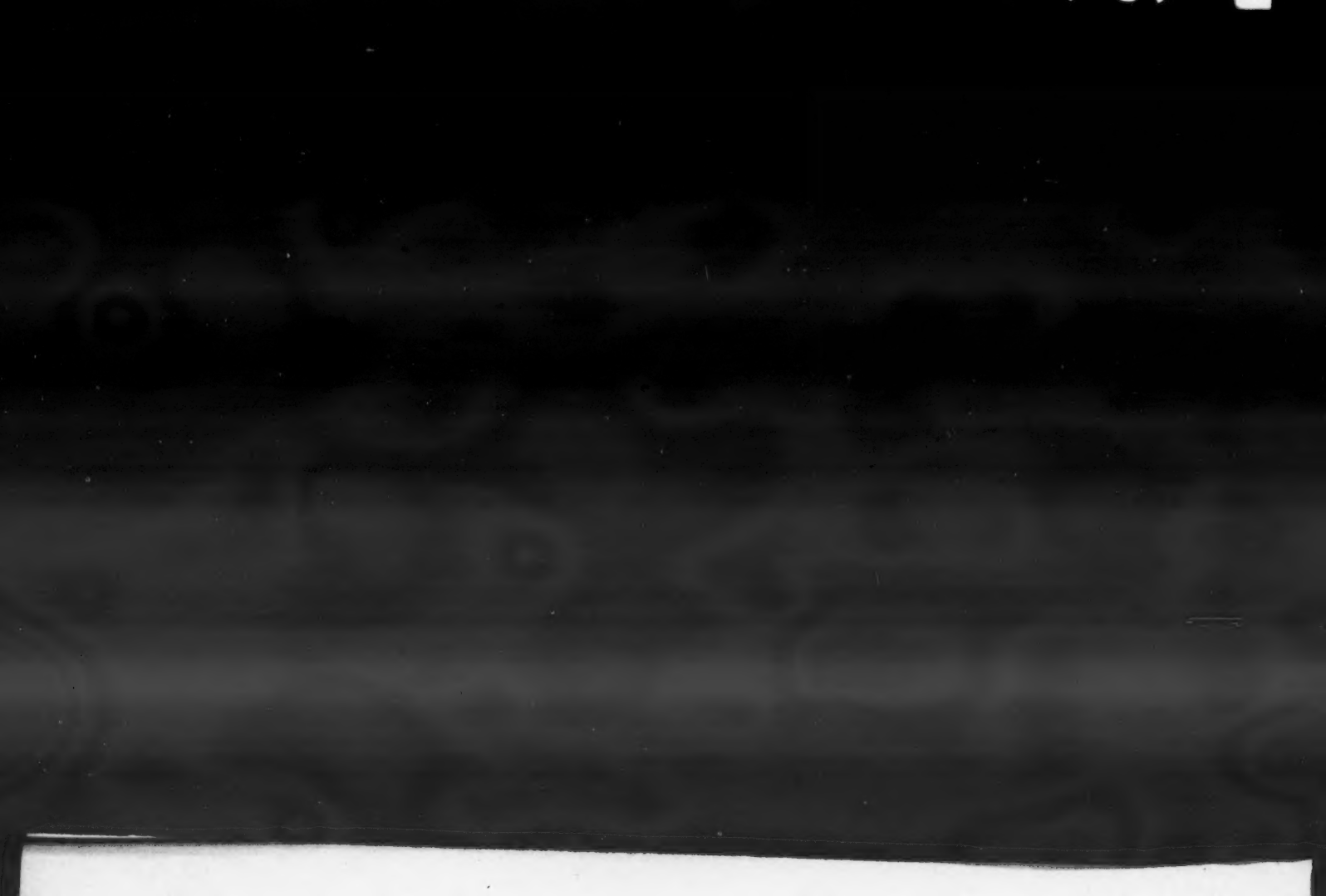
Flights 22 & 23 1938
Flights 22 & 23 1939


S O U T H E R N
T R A L I A N
T E R R I T O R Y
A N T A R C T I C
Mac-Robertson Land
(Longitudinal limits assigned by the Commonwealth Government)
Princess Elizabeth Land
Kaiser Wilhelm II Land
Queen Mary Land
Banzare Rise
"Discovery" 1929-30
M "Discovery" 1930-1931
M "Discovery" 1929-30
G.J. No. 101
(British, Australian and New Zealand Antarctic Research Expedition)
M & C Flights 4 to 7.31
C & D Flight 6.7.31
Mac-Robertson Land
Darnley
Fletcher
Princess
Elizabeth
Davis Sea
Drygalski I.
Shackleton
Masson I.
Henderson
Bay of Whales
David I.
Queen Mary Land
Wilkes
70°
90°
100°

are Rise
O C E A N
90°
60°
100°
110°
65°
110°
arctic Research Expedition from 1929 to 1931)
M "Aurora" (survey parties) From the Australian Antarctic Expedition, 1911-1914, examined coast from 83° to 110° E.)
M "Discovery" 1930-1931
M "Aurora"
GJ 44-357
Drygalski I.
Shackleton Shelf
Massey I.
Henderson
Bay of Winds
David I.
Borchgrevink
Nordenskjöld Antarctic Circle
Aurora
Wilkes "Vincennes" Exp.
U.S. Chart No 570
Wilkes Land
Knox Land
Adelie Land
Victoria Land
Scott Coast
Denman Glacier
Mt. Anderson
Mt. Sheldon

ANTARCTIC